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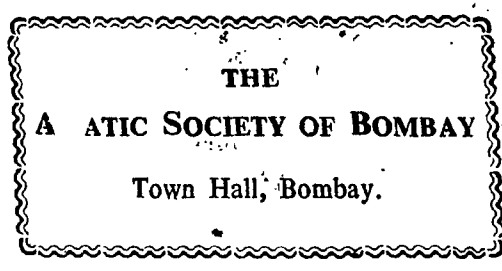

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NATIONAL CYCLOPÆDIA

OF

USEFUL KNOWLEDGE.

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SIEGEN, LUDWIG VON—THEBES.

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THE

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USEFUL KNOWLEDGE.

SIEGEN, LUDWIG VON, was born at Utrecht in 1609, of a noble family of Westphalia. His father Johann entered the service of Prince Maurice of Hesse, and removed in 1620 to Cassel, where he was placed at the head of the Collegium Mauritianum. Ludwig von Siegen was educated in this college. He remained in Cassel until 1626, when William V., Landgrave of Hesse Cassel, suspended the college. Johann von Siegen retired to Juliers, and afterwards to Kampen in Holland, where he died in 1655.

Scarcely anything is known of the life of Ludwig von Siegen from the time that he left the college of Cassel in 1626 until 1637, when he was appointed page to the young prince William VI., by his mother the regent Amelia Elizabeth of Hanau. It was during these years, between 1637 and 1641, that Siegen discovered his method of Mezzotinto engraving; but he removed in 1641, or in the beginning of 1642, to Amsterdam, without imparting his secret in Germany. On Aug. 19, 1642, he sent a letter from Amsterdam to the Landgrave of Hesse, inclosing some proofs of a portrait of his mother Amelia Elizabeth, and the plate of these prints is the first mezzotinto engraving. It was not published until 1643, when it appeared with the date altered to that year, together with a portrait of Elizabeth of Hungary; and the prints drawn off by Siegen himself, not already disposed of, were altered with a pen to the same date. Specimens of all three still exist.

He afterwards communicated his method of engraving to Prince Rupert, at Brussels. Prince Rupert communicated it to the portrait painter Wallerant Vaillant, who assisted Siegen in his attempts, and engraved several plates in the style at Brussels and at Frankfort, in 1656 and 1658. A few good prints were also executed by Prince Rupert himself. Evelyn states that Prince Rupert was the inventor of the art, yet from a paper which he himself drew up on the subject, to be read before the Royal Society as a communication from the Prince, the invention is not claimed by the Prince, and this paper is noticed by Evelyn in his 'Sculptura, or the History and Art of Chalcography,' &c., as in preparation: it was written, but was never read before the Royal Society.

Siegen, who had meantime attained the rank of a major in the service of the Duke of Wolfenbüttel, died at Wolfenbüttel, but the date of his death is not known; he was still living in 1676.

SIENA, a division of Tuscany, consisting of the territory of the former republic of Siena, is bounded N. by Florence, W. by Pisa and the Mediterranean, E. by Arezzo, and S. by the Papal State, from which it is partly divided by the river Fiora. The territory of Siena is divided into two *compartimenti*, or provinces, Siena and Grosseto.

The compartimento of Siena Proper comprehends the highlands, or northern and eastern parts of the country; it lies in the upper basin of the Ombrone, and its affluents the Arbia, the Mersa, and the Orcia. The Ombrone, the largest river of Tuscany next to the Arno, rises in a mountain ridge a few miles N.E. of Siena, which forms part of the watershed between its basin and that of the Arno; it flows in a general southern direction, through a narrow valley, into which several others open from the east and west, until it enters the wide plain of the Maremme, near Grosseto, having sent through a canal part of its waters into the lake of Castiglione, in order to fill up by its alluvium that pestilential swamp, while the main stream enters the sea at Torre della Trappola, after a course of about 80 miles.

Siena Proper consists of highlands and valleys, being crossed by various ranges of hills, composed mostly of marls covered by yellow sand, and abounding with organic remains. Few summits exceed 1000 feet, except the Montagna di Cetona, or Monte Pisi, on the borders of the Val-di-Chiana, which is above 2500 feet high; the volcanic cone of Radicofani, which is above 3000 feet; and the partly volcanic group of Montamiata, or Mount Santa Fiora, which rises to about 5000 feet above the sea. The area of the province is stated to be only 465 square miles. The population in 1844 was 237,283.

The principal town is SIENA. *Montalcino*, a walled town and bishop's see, situated on a lofty hill 20 miles S.E. of Siena, has a cathedral; several other churches and convents; an hospital, and orphan asylum; some manufactories of coarse linen, hats, pottery, and leather; and about 3800 inhabitants. *Colle*, on the slope of a hill near the source of the river Elsa, an affluent of the Arno,

12 miles N.W. of Siena, is a thriving town and a bishop's see. It stands in a territory which produces abundance of wine, oil, and silk; and has a fine cathedral, a large hospital, several paper-mills, manufactures of woollens, hats, glass, pottery, and leather; and about 2500 inhabitants.

The compartimento of Grosseto comprehends the western and southern lowlands, including that portion of the Tuscan Maremme which extend along the coast of the Mediterranean from the valley of the Cornia to the river Fiora, being a length of about 70 miles, whilst its breadth from the sea-coast inland is from 15 to 20 miles. The surface of the province is 2528 square miles, with a population of 77,345, exclusive of the island of *Giglio*, which lies off the coast and belongs to the province, and has an area of about 10 square miles, and a population of 2000. Besides the Ombrone, several rivers flow from the hills, which form a belt along the inland side of the Maremme, and crossing the plain, run into the sea after a short course. The Cornia, after a course of 24 miles, enters the lagoon of Piombino, which communicates with the sea. The Bruna enters the lake of Castiglione, which likewise communicates with the sea. The Albegna rises in the Monte Labro, a summit about 3600 feet high, forming part of the group of Montamiata, flows rapidly southwards, passing by the ruins of the Etruscan city of Saturnia, and enters the sea north of Monte Argentaro, after a course of 34 miles. The Fiora rises in the Montamiata group, and running S. for 30 miles through Tuscany, enters the State of the Church. There is a succession of shallow lagunes along the sea-coast, which by their mephitic exhalations in summer occasion malaria fever. The largest are the lagune of Castiglione and the lake of Orbetello, which is salt, and occupies an area of about 10 square miles. Between the lake of Orbetello and the sea rises the lofty promontory of *Monte Argentaro*, which appears to have been once an island. Monte Argentaro is of calcareous formation; it occupies an area 22 miles in circumference, and its summit is about 1700 feet high. It is joined to the mainland by two very narrow and low isthmuses which run between the lake of Orbetello and the sea-coast, the northernmost of which is intersected by a narrow canal, uniting the lake and the sea. The sea at the base of Monte Argentaro is very deep, and forms two good harbours, *Santo-Stefano* on the north, and *Port-Ercole* on the east. The mountain is covered with forests which abound in game; it has copious springs and excellent pastures, and the air is perfectly healthy.

The chief products are corn, wine, oil, silk, timber, and potash. The principal branch of industry in the unhealthy Maremme is the rearing of cattle, which feed in the wide solitary plains, and the cutting of timber in the extensive forests. Corn is sown, but not to a great extent. The wine made in the Maremme is not in much repute. The great hydraulic works executed and carried into operation by the present Grand Duke Leopold II. have already produced a considerable improvement in the soil and atmosphere of the Maremme. The lagunes have been in many instances entirely drained and become cultivable land, and the others have been partially filled; the rivers have been embanked; and a fine road has been opened along the length of the province, parallel to the line of the ancient Via Aurelia.

Grosseto, the head town, built in the middle ages from the ruins of the Etruscan town of Rusellæ, which was a few miles distant, lies in the midst of a wide plain between the Ombrone and the lagune of Castiglione, 45 miles S. from Siena; it is surrounded by walls and bastions, gives title to a bishop, and contains about 2500 inhabitants. *Massa Maritima*, an episcopal town with some fine buildings, is situated on a hill a few miles from the sea-coast, north-east of Piombino. The population is 3000. At *Follonica*, on the sea-coast, 10 miles S. of Massa, are extensive furnaces and iron-works, in which the iron from the mines of Elba is smelted. *Piombino* is a small town on the sea-coast facing the island of Elba, from which it is divided by a channel about five miles wide. The town is fortified, has a small harbour, and about 1500 inhabitants. It lies about 40 miles S. from Leghorn. *Campiglia*, a thriving town, stands in the valley of the Cornia, 10 miles N. from Piombino, in a healthy situation on a hill; it has a handsome church built in the 12th century, an hospital, and a population of 2200. The remains of the Etruscan town of Populonia are on the coast 7 miles S.W. from Campiglia. *Orbetello* is a considerable town, built on a promontory which projects into the salt lake of the same name. The walls of Orbetello are formed of large stones without cement, and the town is strongly fortified on the side of the isthmus which unites it and the mainland. Orbetello has about 3000 inhabitants, and enjoys a healthy climate. The lake abounds with fish. *Pitigliano*, an inland town in a fine situation in the valley of the Fiora at the foot of the lofty group of Montamiata, has about 2000 inhabitants.

SIENA, a city of Tuscany, is situated on a hill surrounded by other hills, 24 miles S. from Florence, and 45 miles E.S.E. from Leghorn, on the road from Florence to Rome. The town is about five miles in circumference. It is an archbishop's see, has a university, a public library of 50,000 volumes and several valuable MSS., a gymnasium, a clerical seminary, and several schools. It has also an academy of the fine arts, an institution for deaf mutes, a large hospital, an orphan asylum, a workhouse for the destitute, a savings' bank, and an asylum for poor children. The population of Siena is about 19,000. The principal manufactures are silks and woollens.

Siena abounds with fine churches all decorated with paintings by good masters. The cathedral, consecrated in 1180 by Pope Alexander III., is rich in marbles, sculptures, and paintings. The exterior is cased with marble, black and white. The pavement is of white marble, on which numerous figures have been engraved or cut in, representing biblical subjects. In the annexed hall, called the Bibliotheca, are ten frescoes by Pinturicchio, representing the principal events of the life of Pope Pius II. The splendid chapel of the

Chigi family, constructed by Pope Alexander VII., is rich in lapis-lazuli and green marble, bronzes and statues. The baptistery, which is a separate church detached from the cathedral, is an octagon, and entirely cased with marble inside and out, and adorned with sculptures by the earliest Tuscan artists. In the church of San-Domenico is a good painting on wood, of the date 1221, representing the Virgin and Child by Guido of Siena, long before the birth of Cimabue, who has been generally considered as the restorer of Italian painting. In the academy of the fine arts of Siena there is a painting of St. Peter and St. John by Pierrolino of Siena, who flourished about 1100. In the street dell' Oca is the house, now converted into an oratory, in which Saint Catherine of Siena was born in 1347.

The Piazza del Campo, mentioned by Dante ('Purg.' xi.), is concave, surrounded by arcades, and adorned with a fountain: it was once the forum of the republic of Siena. Eleven streets branch out of it. The streets of Siena are generally narrow, crooked, and uneven. The general appearance is that of an old decayed city. In the 14th century, before the great plague of 1348, the population of Siena and its suburbs amounted to 180,000. The people of Siena are noted for the purity and melody of their speech.

Among the palaces the most remarkable is the Palazzo del Publico, or town-house, a massive structure of the middle ages, which is adorned with frescoes of the 13th and 14th centuries, commemorating events of the national history. The archives of the old republic, which had been removed to Paris by Napoleon, have been restored. The palaces Petrucci, Piccolomini, Saracini, Bandinelli, and Buonsignori contain good paintings. The town gate, called Porta Camollia, is remarkable for its architecture. Siena is well supplied with good water by aqueducts from the neighbouring hills, and is adorned with several handsome fountains.

SIENITE. A compound of quartz, felspar, and mica, being called Granite, we find in many instances hornblende instead of mica, and the rock is then called Sienite or Syenite (from Syene in Egypt, where such a rock is well known).

SIERCK. [MOSELLE.]

SIERRA LEONE (properly Leona) is the name of a cape situated on the west coast of Africa, near 8° 30′ N. lat., 13° 20′ W. long.; but when the English established a colony in the vicinity of this cape, the name was extended to the colony, and to that tract of country which was annexed to it. At present the term is generally used in this sense. Geographers frequently use the term in a still more extensive signification. As the countries of Western Africa south of the Sahara are divided into many small states which are very imperfectly known, in order to promote perspicuity geographers have found it necessary to introduce an arbitrary division, arbitrary as far as regards the political state, but founded on the physical geography of the country. Thus the term 'Coast of Sierra Leone' is applied to those parts of Western Africa which are drained by the rivers which fall into the Atlantic between Cape Verga (10° 12′ N. lat.) and the Island of Sherboro (7° 30′). The area of the entire tract termed the Coast of Sierra Leone is about 25,000 square miles. Nearly the whole of this coast is low, except Cape Verga and Cape Sierra Leone. The peninsula of Sierra Leone, which constitutes the territory of the colony, is surrounded on the north, west, and south by water: on the east it is connected with the mainland of Africa by a low tract, intersected by numerous creeks and rivers, which overflow during the rainy season, and form extensive swamps. The river Rokelle bounds the peninsula on the north, and falls into the sea by a wide æstuary called the Sierra Leone River. On the south the peninsula is bounded by Yawtry Bay. The peninsula extends from north to south about 18 miles, and from west to east 12 miles. The area is about 220 square miles. The interior of the peninsula is an elevated region of uneven surface, which rises from 400 to 1000 feet above the sea, and is overtopped by conical peaks, which attain an elevation of between 2000 and 3000 feet. The British have introduced the products of the West Indies, coffee, sugar, indigo, ginger, and cotton, which generally succeed well, especially the coffee. Some European fruits are cultivated on the higher parts, and the vine flourishes in the gardens of Freetown. Yams, mandioc, pumpkins, plantains, and Indian corn constitute the principal food of the inhabitants. Nearly all English garden vegetables are raised in this tract.

There are two seasons, the wet and the dry. The former lasts from May to November, and is always ushered in and terminated by tornadoes. Nothing can exceed the gloominess of the weather during this period. The hills are wrapped in impenetrable fogs, and the rain falls in such torrents as to prevent any one from leaving his house. At this period the diseases which prove so fatal to the coast have generally made their appearance. Being at no great distance from the equator, a high degree of heat is experienced all the year round. It is even probable that the mean heat of this country exceeds that of the equator, being between 81° and 82°. There is a pretty regular succession of sea and land breezes.

Poultry is abundant, but of a very diminutive kind. The wild animals are—the elephant, buffalo, a species of antelope, monkeys, leopards, and wolves. The hippopotamus is found in the lower parts of the rivers, and several kinds of snakes are numerous. The guinea-fowls, which are plentiful, are much larger than those in England. Fish abound in the rivers and along the shores. Wild bees are very numerous, and honey and wax constitute articles of export. Iron is worked in the more hilly part of the country. The natives have much gold, but it is brought from the countries on the upper part of the Joliba. Salt is made along the low shores.

Five different tribes inhabit this country, all of whom belong to the negro race, but they have attained different degrees of civilisation. The country north of the river Kaba is occupied by the Mandingoes. Between this river and the Rokelle are the Timannees near the sea, and the

Limba farther inland. South of the Rokelle are the Kooranko, and the most eastern portion is occupied by the Soolima. It is probable that there are other tribes in those parts of the country which have not yet been visited by Europeans. The Mandingoes are the only tribe who are not heathens; they have embraced Mohammedanism.

The British Colony of Sierra Leone was established in 1787, by some philanthropists, who intended to show that colonial productions could be obtained without the labour of slaves. In that year 470 negroes, then living in a state of destitution in London, were removed to it, and in 1790 their number was increased by 1196 individuals of the same race, who had been settled in Nova Scotia, but could not bear the severity of that climate. Ten years later 550 Maroons were transported from Jamaica to Sierra Leone; and in 1819, when a black regiment in the West Indies was disbanded, 1222 black soldiers and their families were settled there likewise. In 1820 the population amounted to 12,000 individuals. Since the abolition of the slave-trade (1807), the slaves captured by the British cruisers have been settled in the colony; and the population has increased so that in 1848 it amounted to 46,511.

Freetown, the capital, stands on the north side of the peninsula, and on the south bank of the Sierra Leone River, about five miles from the sea, in 8° 29′ 30″ N. lat. and 13° 9′ 27″ W. long., on an inclined plain at the foot of some hills, on which are the fort, the barracks, and some other public buildings. It is 50 feet above the sea-level at high-water mark, and regularly laid out into fine wide streets, intersected at right angles by others parallel to the river. Many of the houses are commodious and substantial stone buildings. The houses in 1847 amounted to 4200, and the population 18,000. There are a church missionary grammar school and day-school, a Wesleyan institution and day-school, and several other schools, a church, seven chapels, a lighthouse (finished in 1849), a literary institution (established in 1849), a market-place, &c.

To the colony are annexed the islands called Ilhas dos Idolos, commonly called the Isles de Loss, which were purchased in 1818. They consist of three principal islands—Factory, Crawfurd, and Tamara, and several small islets and reefs, enclosing a convenient and safe anchorage for shipping about 9° N. lat., 13° 30′ W. long. The government has also purchased the Banana Islands, which lie opposite Cape Shilling, the south-western extremity of the peninsula.

The towns, or rather villages in the settlement, besides Freetown, are—Kent, York, Calmont, Waterloo, Hastings, and Wellington. Of the 46,511 inhabitants in the settlement, 20,000 attend Christian worship, 2000 are Mohammedans, and the rest heathens. About 20,000 are liberated Africans, and about an equal number are descendants of liberated Africans, born in the colony. The number of Europeans is very small. There are about sixty places of worship in the settlement, of which the Wesleyan Mission has established fifteen. There were nearly 8000 children at the various schools in 1846. The imports in 1848 amounted to 89,174*l.*, and the exports to 95,617*l.* The chief article of export is ground nuts, from which is expressed an oil largely used in lubricating machinery: in 1846 the quantity amounted to 8697 tons, valued at 92,049*l.* The other chief articles of export are—ginger, teak timber, hides, palm oil, and camwood. Nearly one-third of the imports consist of British cotton goods. The revenue of the settlement in 1846 was 27,615*l.*, and the expenditure 23,679*l.* The land under cultivation in 1847 was 32,854 acres. There is a victualling establishment, with stores for 800 men. The vessels which arrived at Freetown in 1847 were 185. There are about 120 fishing-boats belonging to the settlement.

SIERRA MORENA. [ANDALUCIA.]

SIERRA NEVADA. [ANDALUCIA.]

SIÉYES, EMMANUEL JOSEPH, commonly called the Abbé Siéyes, was born at Fréjus on the 3rd of May, 1748. He completed his studies at the University of Paris, where his mind became imbued with the philosophical speculations prevalent at that period, and he applied himself to the investigation of the various schemes of social reform which were suggested. By the patronage of the Bishop of Chartres, he was appointed to a canonry in that Cathedral, and afterwards became Vicar-General and Chancellor of the diocese. He took an active part in various assemblies of the clergy, and warmly espoused those opinions which were producing the revolution of 1789. When the disordered state of the public finances compelled the government to summon the States General, the question arose, in what manner that body should be constituted; whether, when they were assembled, they should vote as in the last assembly of 1614 by orders, or as individual members? To this question Sieyes replied by three pamphlets, which were skilfully adapted to the prevailing opinions on the subject. The second and most remarkable was intitled 'Qu'est ce que le Tiers État?' in which he asserted that the 'Tiers État' is the nation itself. On the convocation of the States-General Sieyes was elected deputy for Paris. On the refusal of the majority of the nobles and clergy to unite with the Tiers État, and to verify their powers in common, he moved that the representatives of the people constitute themselves into the National Assembly (June 17, 1789), which was carried by a large majority. On the 23rd of June, when the king declared the resolutions of the Assembly null, Sieyes said to the members, 'You are to day what you were yesterday.' The Assembly persisted in their resolutions. Sieyes has the credit of suggesting the new division of the kingdom into departments; but the scheme was explained to the Assembly by Thouret. The Assembly however soon went beyond the limits of the Abbé's reforming principles. He objected to the abolition of tithes without compensation to the clergy. When Sieyes complained to Mirabeau of the headlong course of the Assembly, he got the reply—'You have unloosed the bull, and you complain that he gores you.'

Sieyes was elected in 1791 to the Legislative Assembly; and also to the Convention for 1792. But he took no active part in either of these bodies. At the trial of Louis XVI., in January, 1793, he voted for the king's death. During the reign of terror Sieyes kept out of the way, and luckily escaped the scaffold.

After the fall of Robespierre he returned to the Convention, and by his influence obtained the recall of the proscribed members of the Gironde party. In 1795 he again took an active part in the management of affairs, and was named a member of the new Comité du Salut Public.

In 1798 Sieyes was sent on a mission from the French Government to the Court of Berlin, in which, though he failed in his attempt to form an alliance with that power, he succeeded in securing its neutrality. On his return to Paris the following year he was named member of the Directory, his dissatisfaction with the directorial administration being very well known. Placing himself at the head of a conspiracy which had been formed against three of his colleagues, who were known for their republican sentiments, he procured their forced resignation, and a new Directory was formed, in which the majority was favourable to his views. Another important measure which he effected through the instrumentality of the Minister of Police, Fouché, was the closing of the Jacobin Club. These measures, as they destroyed the popularity of the author of the Tiers État, made him anxious to secure the support of some military leader who was possessed of sufficient talent and energy to take upon himself the direction of the affairs of state. The man whom he wanted soon appeared. It was Bonaparte, who had just come back from his Egyptian expedition. The revolution of the 18th of Brumaire (9th November, 1799) was the result of the union of Bonaparte and Sieyes, who, with Roger-Ducos, were made Consuls; and two commissions of twenty-five members each were appointed from each Council of State to assist the consuls in the formation of a new constitution. In the formation of this constitution Sieyes and Bonaparte soon disagreed. Sieyes had according to his practice elaborated a paper constitution, which was not accepted. He found that in place of a tool he had got a master, and the proclamation of the new constitution of December, 1799, terminated his political career. But he received the solid indemnity of a large sum of money, and the rank of senator under the new constitution.

Under the Consulate and the Empire Sieyes took no part in public affairs, but under the Empire he accepted the title of Count. At the Restoration he was exiled, and only returned to France after the revolution of 1830, fifteen years afterwards. He died at Paris, in tranquil obscurity, June 20, 1836.

Sieyes had a very high opinion of himself, and little regard for the opinions of others. There was nothing about him that any one could like. His speculations and schemes were singular, but not profound. If he saw the way to make a revolution, he certainly had not sagacity enough to foresee the consequences of it. He remarked on one occasion that the 'art of government was a science which he considered that he had brought to perfection;' a saying which, if it is true, gives us a just measure of his presumption and his ignorance.

SIGEAN. [AUDE.]

SIGHT (vision, the faculty of seeing). The structure and uses of the several component parts which enter into the formation of the organ of vision, are stated under EYE. From a case recorded by Cheselden, in which a young man, who was born blind, was suddenly restored to sight by the operation of couching, we learn that the sense of sight originally gives us no information respecting the solidity, the distance, or the real magnitude of objects; but that they all seem as if painted on one surface. The lad couched by Cheselden could not recognise by sight the things whose form he before knew from feeling; but upon being told what they were, he would carefully observe, that he might know them again. The infant, in like manner, stretches out its little hands to grasp and examine each object in succession which attracts its sight, and the greater part of its waking hours is employed in thus compariſg the sensations obtained through these two different channels. That we acquire important information respecting the size and forms of bodies through the sense of touch, there can be no doubt; that the knowledge obtained through our visual organs would be imperfect without it, and that it may in some measure be a corrective of those optical illusions which are so frequent when we attempt to judge of things by sight alone, is equally probable; but, in admitting this, we must not underrate the original powers of the eye and the quantity of knowledge which we primarily derive from it. Physiologists have been too much swayed by the opinion of Gassendus, Haller, Gall, and others, that we see with only one eye at a time; and those even who disputed this have been more anxious to explain why objects are seen single with both eyes than to inquire into the uses of our possessing two. These defects, which are more or less common to all writers on optics, have been remedied by some very interesting observations of Professor Wheatstone on Binocular Vision, in which he has shown that the simultaneous affection of the two retinæ, provided the optic axes are not parallel, excites a different idea in the mind from that consequent on either of the single impressions; the latter giving rise to a representation on a plane surface, the former to that of an object in relief. This is owing to a different perspective projection of the object being seen by each eye: thus, if any figure of three dimensions, a cube for example, is held at the distance of about seven inches before the eyes, and viewed with each eye successively while the head is kept perfectly steady, the picture presented to the right eye will be different from that seen by the left. And thus it is that our conviction of the solidity and projection in relief of bodies depends upon a different perspective image of them being presented to each retina. As this however can only take place when the axes of the

eyes are made to converge to them, it follows that when objects are at such a distance that in regarding them the optic axes are parallel, their images on the retinæ will be exactly similar, and the idea conveyed to the mind will be the same as if they were seen with one eye only. We judge of the motion of bodies partly from the movement of their images over the surface of the retina, and partly from the movement of our eyes following them. If the image upon the retina moves while our eyes and body are at rest, we conclude that the object is changing its relative position with regard to ourselves. In such a case the movement of the object may be apparent only, as when we are fixed upon a body which is in motion, such as a ship. On the other hand, the image may remain fixed on the same spot of the retina, while our eyes follow the moving body; we then judge of its motion by the sensations in the muscles which move the eyes. If the image moves only in correspondence with the actions of the muscles, as in reading, we infer that the object is stationary. The colour of luminous bodies depends upon the quality of the light they emit; the colour of bodies that are not luminous is due to the light which falls upon them, and is reflected by them towards our eyes. When a body absorbs all the rays of light which fall upon it, its colour is black; when it reflects them all it is white; and when it absorbs some and reflects others, it is coloured. The question has often been raised, why is it that we see objects erect, while their images on the retina are inverted? According to most physiologists, it is by virtue of a certain property of the retina by which each point of an object is seen in the direction of a line perpendicular to its surface: now since this surface is concave, the rays proceeding from an object which fall on the lower part of its concavity will incline upwards, while those which impinge on its upper part will incline downwards; and thus the object presented to the mind will be the reverse of that which is depicted on the retina.

Myopia (or *Near-Sightedness*) is from *μύω*, 'I shut,' and *ὤψ*, 'the eye,' a short-sighted person being in the habit of winking, or half shutting his eyelids, when he endeavours to see objects distinctly. When the images of surrounding objects are brought to a focus in the eye before they reach the retina, such an eye is myopic, or near-sighted. Individuals thus affected cannot see objects distinctly at the ordinary distance of distinct vision, but require them to be brought nearer, so as to ensure their images being at the proper focus for distinct vision. The cause of myopia is an over-refractive condition of the eye; either the cornea or the crystalline lens is too convex, or the humours of the eye generally are too dense or too abundant.

The best means of alleviating this condition of the eye is the use of concave glasses. The manner in which concave glasses improve the vision of near-sighted persons is by causing a divergence of the rays of light before they enter the eye, thus counteracting the over-refractive condition of that organ. The glasses that are most commonly used are double concaves, of equal concavity on each side; they are numbered 1, 2, 3, 4, &c., beginning with the longest focus or shallowest concavity. Unfortunately there is no uniform standard adopted in the manufacture of these glasses, so that what one optician calls No. 1, another rates as No. 2, and so on; it is therefore advisable that those who wish to fit themselves with spectacles should try a series of them at an optician's shop, and they should be content with the lowest number with which they can see objects clearly across the street: if it diminishes them much, or gives them a dazzling appearance, or if the eyes feel strained after looking through them for a short time, they are too concave. Spectacles are always preferable to a single eye-glass; and when the individual has met with a pair which suit him, they should not be heedlessly changed for any of deeper concavity. It is also advisable not to wear them constantly, but only on occasions when their assistance is absolutely required.

Presbyopia (or *Far-Sightedness*) is from *πρέσβυς*, 'old,' and *ὤψ*, 'eye;' this being a state of vision to which old age is almost invariably subject.

Long-Sightedness, as the name sufficiently indicates, is an affection the reverse of near-sightedness, and depends upon opposite causes. Either the refractive powers of the eye are too feeble, or its axis is shorter than is natural; the result is an imperfectly-formed image on the retina, from the rays of light not converging sufficiently soon to be brought to a focus. Hence the far-sighted person removes the object he is examining farther from him, or he makes use of glasses whose effect is to increase the refraction of the rays of light before they enter his eye. In this case convex glasses must be employed. They should not be had recourse to too soon, nor should too high a power be used, but the lowest that answers the purpose should be chosen.

Double Vision may arise either from a want of correspondence in the movements or position of the two eyes, the vision of each eye singly being perfect; or there may be double vision with one eye only, while the harmony in the movements of the two is not disturbed. The most common example of the first form of the affection is afforded by cases of SQUINTING. More serious and less common is the loss of harmony in the movements of the eyes which results from paralysis of one or more of the orbital muscles.

Defective Perception of Colours.—There are some individuals whose eyes present no apparent defect, and who can distinguish clearly the size and form of objects, yet are unable to perceive a difference between certain colours. These persons differ much in the degree of their defect, as well as in respect of the colours which they confound together. This defect is irremediable.

SIGILLARIA. [COAL PLANTS.]

SIGN (Astronomy), formerly a constellation; but in modern times a constellation of the ZODIAC only.

SIGN (Mathematics). Every symbol is a sign of something or other, the original meaning of the word sign applying to any mark of distinction or designation. The general consideration of the

subject of signs comes under the word SYMBOLS; for this term sign is exclusively applied in mathematical analysis to the signs of addition and subtraction (+ and −). A positive quantity, as +3, is said to have the positive sign; a negative quantity, as −3, the negative sign.

SIGN-MANUAL means, in its widest sense, the signature or mark made by a person upon any legal instrument to show his concurrence in it. Before the art of writing was common, the sign-manual or signature was usually a cross, attested either by the seal of the party, containing his armorial bearings, or by the signature of another person declaring to whom the mark belonged. The latter is still the practice with persons who cannot write.

Sign-Manual is now used to denote the signature of a reigning prince. It is usually in this country the prince's name, or its initial letter, with the initial of his style or title in Latin. Thus the sign-manual of the present queen is Victoria R., or V. R.

The royal sign-manual is requisite in all cases where the privy seal and afterwards the great seal are used. The sign-manual must be countersigned by a principal secretary of state, or by the lords of the treasury, when attached to a grant or warrant, and it must also be accompanied by the signet or privy seal. But where the sign-manual only directs that another act shall be done, as for letters-patent to be made, it must be countersigned by some person, though not necessarily by these great officers of state. The authenticity of the sign-manual is admitted in courts of law upon production of the instrument to which it is attached. (Comyns's 'Digest.')

SIGNATURE, in Printing, is the name given to the letters or figures which are placed at the bottom of certain pages in each sheet of a book, to facilitate the gathering, folding, collating, and binding of it.

SIGNET, SEAL. The impression of a seal has been used from the earliest times to prove the authenticity of the documents to which it is attached. A seal, or something which is called a seal, is necessary in England to make the instrument called a deed. [DEED.]

The law recognises three royal seals:—1. The Great Seal, which is in the custody of the lord chancellor. This is appended to all letters-patent. The great seal is essential to all royal grants of inheritances or chattels real, to grants of an office in fee, and to all writs at common law. Where the king's seal is mentioned, it is understood to be the great seal. 2. The Privy Seal, which is in the custody of the lord keeper of the privy seal. This seal is valid for the issuing of the royal treasure, or for disposing of chattels, or the contracting or discharging of a debt. It is used as a warrant for letters-patent before they pass the great seal. 3. The Signet, or Privy Signet, which is in the custody of the principal secretaries of state. Excepting that it authenticates the sign manual, this seal seems to have no validity. For the use of all the seals the countersignature of a principal secretary of state is required by statute.

SIGNORELLI, LUCA, born at Cortona in 1439, was the son of Egidio di Ventura Signorelli, by the sister of Lazzaro Vasari, and he was the pupil of Piero della Francesca.

Vasari mentions many of Luca's works, few of which however now exist; but the altar-piece of St. Onofrio, painted in 1484, is still in the cathedral of Perugia, and there are two other pictures in the cathedral of Volterra; there are also some pictures by him at Orvieto, Rome, Cortona, at Siena and in its neighbourhood, and in the Florentine gallery. His most celebrated work is the fresco of the Last Judgment in a chapel of the cathedral at Orvieto.

He retired in his old age to Cortona, and died in 1521. The frescoes of the cathedral are described and in part engraved in Della Valle's 'Storia del Duomo d' Orvieto,' Rome, 1791.

SIGO'NIO CA'ROLO, was born at Modena, about the year 1520. Franciscus Portus taught him Greek. He afterwards studied medicine and philosophy at Bologna, and he also visited the university of Pavia. In 1546 he was invited back to Modena to fill the chair of Greek literature, which had become vacant by the departure of Portus. In 1552 he accepted a professorship at Venice; and in 1560 he became Professor of Eloquence at Padua. In 1563 he left Padua for a place in the University of Bologna, where he had a good salary, and his reputation attracted many students. His special subject was Roman antiquity. He wrote Latin well, as is shown by his success in passing off a treatise 'De Consolatione,' which he wrote himself, as the genuine work of Cicero, which bore the same title, but is lost. Sigonio died near Modena in 1584. His collected works were published at Milan, 1732-7, in six volumes, folio. His writings on antiquity are also contained in the 'Thesaurus' of Grævius and Gronovius. Sigonio was one of the great scholars of Italy whose labours have contributed to our knowledge of classical antiquity.

SIGUENZA. [CASTILLA-LA-NUEVA.]

SIKE, or SIECKE, HENRY, an Oriental scholar of some repute, was a native of Bremen, and a professor of Oriental languages at Utrecht, and afterwards at Cambridge. It appears that owing to some misdemeanor he was to be subjected to punishment; and to escape from this disgrace, he put an end to his life by hanging himself in 1712. The only work of any note which he published is the 'Evangelium Infantiæ Christi, adscriptum Thomæ,' 1697, 8vo., a very curious apocryphal gospel. It is reprinted in Fabricius's 'Codex Apocryphus Novi Testamenti,' tom. i., pp. 127-212.

SIKHS. [HINDUSTAN, vii., 213, 214.]

SI'LAUS, a genus of plants belonging to the natural order *Umbelliferæ*, and the tribe *Seselineæ*. *S. pratensis*, Meadow Pepper Saxifrage, a smooth dark-green herb, is found in damp and moist places in England and in various other parts of Europe. The whole plant has an unpleasant smell when bruised, and is said in some parts of Norfolk to give a bad flavour to the milk of cows feeding on it, and it is generally found that cattle avoid it in pastures. The species of this genus are not numerous.

SILENA'CEÆ, a natural order of plants, belonging to the syncarpous group of the Polypetalous subclass of Exogens. This order is a part of the larger order *Caryophylleæ* of Jussieu, and was originally separated by De Candolle.

SILE'NE, the name of an extensive genus of plants belonging to the natural order *Caryophyllaceæ*. *S. acaulis*, Stemless Catchfly, or Moss Campion, is a native of Europe, and is found abundantly on the Alps. It is found on nearly all the Scottish mountains, and also on Snowdon, and the highest hills of Devonshire. Chamisso also gathered it on the islands of the western coast of North America. The flowers are of a beautiful purple colour, and it forms one of the greatest ornaments of our Alpine flora. *S. inflata*, Bladder Campion or Catchfly, is a very common plant throughout Europe, and is met with in almost every field and wayside in Great Britain. It has been recommended to be cultivated in the garden on account of its edible properties. The shoots gathered young, when about two inches high, and boiled, are a good substitute for green peas or asparagus. *S. noctiflora*, Night-Flowering Catchfly, is a native of Sweden, Germany, and Great Britain; it resembles very much the common Red and White Campion (*Lychnis dioica*). It is not a common plant, and is remarkable for opening its flowers at night only, and in warm weather, when they exhale a powerful and delicious scent. *S. quinquevulnerata*, Five-Wounded Catchfly, is a native of Spain, France, and Italy, and has been found in the county of Kent in Great Britain. It is frequent in gardens, but loses by cultivation much of the colour of its flowers. *S. muscipula*, Spanish or Fly-Trap Catchfly, is a native of Spain, with intensely red petals. It is exceedingly clammy, so that when flies alight on it they are caught; and hence the name Catchfly, which is given to the whole genus, though few of the species possess the property. *S. fructicosa*, Shrubby Catchfly, is frequently cultivated in gardens, and makes a handsome ornament. *S. compacta*, Close-Flowered Catchfly, is a native of Russia, and very nearly resembles the *S. armeria*. It is one of the most beautiful of the genus, and deserves a place in every collection of flowers.

SILE'NUS, a Greek deity. The traditions of his birth are various. He was the instructor of Bacchus, a lawgiver, and prophet, sometimes confounded with Bacchus himself, of the family of Satyrs, whom he resembled very much in appearance and habits. He is represented as an old man, bald, with a beard, and depressed nose, sometimes with a tail, at times holding the infant Bacchus in his arms, or with a wine-skin on his shoulders. He has a conspicuous place in the Bacchic chorus, and occurs in various combinations with fauns and nymphs.

SILESIA, a province of Prussia, is bounded N.W. by Brandenburg; N.E. by Posen; E. by Poland; S.E. by Cracow and Galizia; and S. by Austrian Silesia and Bohemia. The province is 210 miles in length from N.W. to S.E., with a breadth of 70 to 80 miles. The river Oder, which becomes navigable soon after entering the Prussian boundary, divides the province in its whole length into two nearly equal parts, which are very different from each other. The territory on the left bank is mountainous, but has a very fertile soil. The country on the right bank is mostly flat; it has chiefly a sandy and unproductive soil. There are however some sandy tracts on the German side, and some rich and productive spots on the Polish side. The surface slopes from south-east to north-west.

Where the frontiers of Silesia and Bohemia meet, a mountain-chain rises, which extends southwards to the sources of the Breswa and the Ostrawitza, where it joins the Carpathians, divides the basin of the Oder on the one side from those of the Elbe and Danube on the other, and forms the natural boundary between Silesia and Bohemia and Moravia. This chain, called the Sudetic Chain, is divided into different parts, bearing different names, as the Isergebirge, the Riesengebirge, the loftiest and wildest part of the whole chain, the Schneekoppe, which is 4950 feet above the level of the sea, the Glatz Mountains, &c. In the interior there are some ranges unconnected with the great chain. The principal feeders of the Oder that drain the province are, the Elsa, the Klodnitz, the Slober, and the Bartsch, on the right bank; the Oppa, the Neisse, the Ohlau, the Katzbach, and the Bober, on the left. There are few lakes, and those which are so called are rather large ponds. The air on the whole is mild, except in the mountainous tracts; but as we approach the southern frontier, the temperature becomes lower, and the winter longer and more severe.

The animals include horses, horned cattle, sheep, goats, swine, game, fish, bees, and domestic poultry; wolves, otters, and beavers. The vegetable products, which in unfavourable years are not enough for the consumption, are corn, pulse, potatoes, garden vegetables, fruit, flax, tobacco, hops, madder, woad, teazle, and timber. The minerals are copper, lead, cobalt, arsenic, iron, zinc, sulphur, marble, alum, lime, and coal.

The linen manufacture of Silesia is of great importance. It is carried on with little aid from machinery, and chiefly by the country people, though this branch of industry affords them but a scanty subsistence; it is however their chief occupation. Woollen cloths are manufactured in some towns, and cottons at Reichenbach. There are sugar refineries in several places; woollen-cloth factories, tanneries, breweries, and brandy distilleries in most of the towns. The cotton manufactures are extending; steam machinery has been introduced into the manufactories; at the end of 1846, the province had 3 large and 8 smaller cotton factories, with 35,524 spindles, and 1749 workpeople. The province is divided into three governments, which, with their area and population, are as follows:—

Governments.	Square Miles.	Pop. in 1847.
Breslau . . .	5,251	1,165,994
Oppeln . . .	5,143	987,318
Liegnitz . .	5,301	912,497
Total . .	15,695	3,065,809

The population is partly of German, partly of Slavonic origin; 1,558,215 are Evangelicals, 1,476,905 Roman Catholics, 28 Greeks, 11 Mennonites, and 30,650 Jews.

The Vienna-Breslau Railway traverses the province at a little distance from the Oder as far as Breslau, where it is joined by the Berlin-Frankfort-Breslau line. Branch railways join the Vienna-Breslau line with Cracow, Neisse, Freyburg, and Schweidnitz; the Cracow branch crosses the Vienna-Warsaw line. A railway is projected also between Breslau and Posen.

The government of Breslau comprises the central part of the province, and is named from its capital BRESLAU. *Brieg*, a large manufacturing town of 11,000 inhabitants, is situated 28 miles by railway S.E. from Breslau, on the left bank of the Oder. It was formerly fortified, and still has a castle and an arsenal. The church of St.-Nicolai, famous for its fine organ, the gymnasium, and the lunatic asylum are the most remarkable objects in the town. The industrial products include woollen cloths, linen, tobacco, beer, &c. A railroad joins Brieg to Neisse, which stands 31 miles to the southward. *Frankenstein*, 36 miles S. from Breslau, stands on a high hill near the left bank of the Pause, and has a population of 6000, who manufacture broadcloth, linen, aqua-fortis, straw-plat, saltpetre, &c., and trade in corn. Seven miles to the south-west of this town is the strong fortress of *Silberberg*, erected under Frederick the Great to defend one of the mountain-passes into Bohemia. *Glatz*, 16 miles S.S.W. from Frankenstein, is a strongly-fortified town situated in a narrow valley on the left bank of the Neisse, and has 9000 inhabitants, including the garrison. It is surrounded by walls, and defended by an old castle built on a high hill, and by a regular modern fortress erected on a hill on the opposite side of the town. Linen, leather, damask, broadcloth, and hosiery are manufactured. The town has a gymnasium, and a Catholic college. *Oels*, 16 miles N.E. from Breslau, stands on the Oelse, and has 5600 inhabitants, who manufacture broadcloth and linen. The castle, the former residence of the princes of Brunswick-Oels, contains a valuable library and collections of natural history. The town has a gymnasium and a theatre. *Reichenbach*, a town of 5000 inhabitants surrounded by walls and ditches, 31 miles S.S.W. from Breslau, has cotton factories, a synagogue, two private observatories, and several benevolent institutions. *Schweidnitz*, a fortified town on Weistritz, is 35 miles by railway S.W. from Breslau; it has a gymnasium, and 9500 inhabitants, who manufacture gloves, leather, broadcloth, beer, tobacco, &c., and trade in wool. The Roman Catholic church of Schweidnitz is adorned with paintings, and has one of the loftiest towers in Silesia. The neighbourhood of Schweidnitz is a very beautiful country.

The other towns of the province are noticed under LIEGNITZ and OPPELN.

SILESIA, AUSTRIAN, till lately united with Moravia, but now a distinct Crownland, is bounded N. by Prussian Silesia, E. by Galizia, S. by Hungary and Moravia, and W. by Moravia and Prussian Silesia. The area is 1980 square miles, and the population is 458,833. The constitution of this Crownland was issued Jan. 15, 1850, granting an elective diet of 50 representatives, who meet in Troppau. The face of the county is described, and the chief towns are noticed, under MORAVIA.

SILEX. [SILICIUM.]

SILHET is a district which extends along the eastern border of Bengal, on the east side of the Megna, as the lower course of the Brahmapootra is called. Silhet, in its present extent, lies between 24° 10′ and 26° 20′ N. lat., and between 90° and 94° E. long. It is bounded W. by Bengal, E. by Muneepoor, N. by Asam, and S. by the Tiperah Mountains. The area is about 18,000 square miles.

Surface and Soil.—Silhet is naturally divided into two regions. The northern part is a mountain-region, which extends along the southern boundary of Asam, and divides that large vale from the valley of the Barak, which river, as far as it drains Silhet, runs through a wide valley that constitutes the low and level portion of Silhet. The mountain-region comprehends about two-thirds of the country, or 12,000 square miles, and the plain about one-third.

The *Mountain-Region*, of which Silhet now comprehends nearly one-half, at its most eastern extremity is united to the high table-land of Central Asia. Its western extremity comes close to the Brahmapootra, where this river, after leaving Asam, forms its great bend to the south (90° E. long.). The western portion of this extensive mountain-region is called the Garrow Mountains. Only the lower portion of the Garrow Mountains is subject to the British. The interior, called Gonaser, or Ganeswara, is occupied by the Garrows, a mountain tribe which has never been subjected by the princes of Bengal. Adjacent to Gonaser on the east is the mountain-region of the Kasias (Cossyas), which contains an extensive table-land, and many summits from 5000 to 6000 feet in height. The table-land is very sterile; but on the southern declivity of the mountain-mass many fruits are cultivated, as oranges, plantains, and the areca palm; and much honey and wax is collected. On the northern declivity, where fir-trees cover large tracts of land, European fruit-trees grow, especially apples, pears, and plums, and also strawberries and raspberries. That portion of the mountain-region which lies east of the Kopili and Deyung rivers, and extends eastward to the river Dooyong and the boundary of Muneepoor, comprehends Upper Kachar, and is called the Kachar Mountains. It is likewise a table-land, the southern edge of which is marked by an elevated range. The northern edge of the table-land is marked by a range of low hills, and a gentle descent, the greater part of which seems to skirt the southern banks of the Sumoona, an affluent of the Deyung, the country north of that river constituting a portion of the plain of Asam. It is much more thickly inhabited than the other table-land.

The Plain.—Along the southern base of the mountain-region there is a plain, or rather a vale, for along its southern side the mountain-system of

Tiperah rises to a great height. The length of this vale may be about 120 miles, and the average width 40 miles. In the western part of this plain, which is the lowest, the towns and villages, which in some parts, especially to the south, are numerous, are built on mounds of earth. Huts, temples, mosques, and sheds for cattle are huddled together. When the inundations are at their height, in July and August, there are from 8 to 12 feet water on the lower grounds. The eastern half of the plain has a somewhat higher level, is less exposed to inundations, and has a soil better suited for the growth of various kinds of produce. The Tiperah Mountains, which lie to the south of the plain, belong to Silhet only so far as a portion of their lower declivities is included within the boundary of the district. The northern portion of this mountain-region, towards Silhet, as well as that which towards the south enters the district of Chittagong, consists of ranges running south and north, divided by wide valleys. The southern declivities are noted for immense forests of bamboo and large herds of elephants.

Rivers.—The largest of the rivers of Silhet is called in the upper part of its course Barak, and in the lower part Soorma. The Barak originates near 25° 30′ N. lat., and 94° 20′ E. long., and after a tortuous course, it flows into the Megna near Sunerampoor. Of the rivers which join the Brahmapootra a brief notice is given under BRAHMAPOOTRA.

Climate and Productions.—The climate of the lower plain does not appear to differ in any respect from that of Bengal [BENGAL]; but the upper plain has the advantage of earlier rains, which begin to fall in February, and become more abundant in the following months. Owing probably to these rains, the lower plain of Silhet is under water earlier than that of Lower Bengal.

In the forests of the Tiperah Mountains there are herds of elephants, many of which are annually sent to Calcutta. Among the minerals the chunam or lime perhaps is still the most important. Many years ago coal was discovered in the Garrow and Kasia Mountains, but it was not turned to any profit until the introduction of steam-navigation. Coal has been met with also in other places. Iron-ore is abundant in the Kasia Mountains north of Chirra-Punji, where it is worked, and whence iron is sent to Bengal.

Inhabitants.—The inhabitants of Silhet Proper are Bengalis, and hardly distinguishable from that race, in the districts farther west. But among them there are also many families of Hindustani and Persian origin, who are distinguished by their features and the stronger make of the body. The Kacharis form the bulk of the population in Kachar, but they are also found in Asam and Tiperah. They constitute a distinct people, differing in appearance, religion, and customs from the other inhabitants; they are industrious agriculturists. There are also several native races who inhabit the Tiperah Mountains and other wild districts. The Kasias, commonly called Cossyas, call themselves Khyee, and inhabit the mountains, which have obtained their name from this nation. They are an athletic race of mountaineers.

Political Divisions and Towns.—That portion of Silhet which forms a part of the British possessions contains the district of Silhet, and the two countries of Jyntea and Kachar.

1. *Silhet* comprehends the whole of the lower and a part of the upper plain as far east as the Banca Mountains or the Delaseri River. It seems to contain many small towns, and some of considerable extent; among which are Baniachung, containing a large population; Azmerigunj, where boat-building is carried on; Silhet, the seat of the local government; Laour, a commercial town; and Pondua, the market for the Kasias, where they exchange wax, honey, oranges, areca nuts, cassia, and other products of their country, for cotton stuffs, salt, rice, and other provisions.

2. *Jyntea* lies north of the upper plain of Silhet, of which a small portion also belongs to it, and it extends northward to the boundary of Asam. Jynteapoor, the capital, is built not far from the southern declivity of the Kasia Mountains in the plain, about 20 miles to the north of the town of Silhet. The convalescent station of Chirra-Punji is in the territories of the Raja of Koiram, and that of Nungklao is in those of the Raja of Dulla.

3. *Kachar*, or Kirumbha, extends over the larger part of the upper plain, and nearly the whole of the mountain-region which is east of the Kopili and west of the Dooyong. Kachpoor, the capital, is on the plain between the banks of the Barak River and the base of the Bura Ail range: it is a poor place. East of it, and south of the pass of Hatlong, is the village of Oodarbund, which is much resorted to by the Naga tribes, who exchange cotton, ivory, wax, and chillies, for salt, dried fish, conch shells, beads, and brass ornaments.

History.—Silhet Proper seems always to have been subject to the sovereign of Bengal, and it passed with that province under the dominion of the British: but it does not appear that any portion of the mountain-region, or even Lower Kachar, has ever belonged to any sovereign of Hindustan. They were governed by native chiefs, whose quarrels led in 1820 to an invasion by the Birmese; but the British subsequently expelled the Birmese, and took possession of the districts, first as protected states, and then in sovereignty.

SILHOUETTE, a name frequently applied to the black profile portraits commonly known simply as *Profiles* or *Shades*. The latter name indicates the origin of this simple class of pictorial representations, they having been probably suggested by the shadow thrown upon a wall. Silhouettes are executed in various ways. One of the simplest is that of tracing the outlines of a shadow thrown on a sheet of paper, and then reducing them to the required size, either by the eye or by means of a pantograph. [PANTOGRAPH.] Another mode is tracing the outline upon a glass supported in a suitable position, and either coated with a solution of gum-arabic in water, in order to enable a lead pencil to mark upon it, or covered with a

sheet of very thin tracing-paper. The camera-obscura and camera-lucida are also occasionally used for the purpose. A more certain mode of obtaining an accurate outline is by the use of the machine invented for the purpose by Mr. Schmalcalder, and patented by him in 1806. Some of the best profilists greatly improve the appearance of their silhouettes by adding the principal markings of the hair and drapery, which, if judiciously done, has a very good effect.

SILI'CIUM, or SI'LICON, the base of the well-known earth Silica or Flint. By some chemists it is regarded as a metal, and hence the termination of its name in *um*, while others consider it as non-metallic, and more allied to boron, and these adopt the term *Silicon*. Sir H. Davy was the first to separate this substance from Silica.

Silicium is of a dark brown colour, has no lustre, and is a non-conductor of electricity. It is insoluble in water, and incombustible in air or in oxygen gas; it neither fuses nor undergoes any other change when heated in the flame of the blow-pipe.

Oxygen and *Silicon* form only one compound, namely, silica, or silicic acid (Si^1O^1). Silica exists very largely in nature; it is indeed probably the most abundant of all substances whatever. Many of the forms under which it occurs are mentioned elsewhere. [QUARTZ.] Rock-crystal is silica nearly or quite pure, and flints, or white sand, are but slightly intermixed with other bodies. Pure dry silica is an opaque white powder, inodorous, insipid, and gritty. It is infusible by the heat of ordinary furnaces, but by the oxy-hydrogen blow-pipe it is more readily fused than lime or magnesia. Its specific gravity is about 2.7. Some chemists rank it among the acids, as *Silicic Acid;* and the various compounds which it makes with alkalis and earths to form glass are considered as salts, called *Silicates*. Silica is a substance of the utmost importance in many respects; it enters largely into the constitution of minerals, rocks, and fossils, and is employed in the manufacture of glass, porcelain, pottery, bricks, tiles, and mortar.

The compounds which silicium forms with other elements are few and comparatively unimportant; among them are Chloride and Fluoride of Silicon, and compounds of metals with silicon which obtain the designation of *Siliciurets*.

SI'LIQUA (in Botany), a kind of fruit possessed by a large number of plants belonging to the order *Cruciferæ*, and examples may be seen in the Stock or Wall-Flower (*Cheiranthus*), in the Ladies' Smock (*Cardamine*), and in the cabbage, turnip, and mustard.

SILI'STRIA, one of the most fertile parts of European Turkey, is bounded N. by the Danube, which separates it from Wallachia, Moldavia, and Bessarabia; E. by the Black Sea; S. by the sandjaks of Kirk-kilissia and Tchirmen; and W. by Rustchuk and Lower Wallachia. It is crossed in the south by the Balkan, which forms Cape Emineh, S. of Varna; and by a ramification of less height in a northern direction, which terminates on the Black Sea in Cape Calaghriah. From these heights descend the numerous rivers which fertilise the province. The Pravadi, the Buyuk-Camp-Chik, the Nadir, and the Aidos flow into the Black Sea, into which the Danube empties itself on the northern extremity of the province, after receiving the Dristra, the Taban, and the Karasu. It is chiefly an agricultural country. The chief products are excellent wheat, barley, maize, beans, flax, &c. Pasturage is abundant, and great numbers of cattle are reared and slaughtered for the sake of the hides and tallow, which last is sent to Constantinople. Timber and oak planks are plentiful, excellent, and cheap. The steam navigation of the Danube is said to have given a great stimulus to this part of Turkey. A canal has been projected from the Danube to Kustendje, a port on the Black Sea, to avoid the long, tedious, and difficult navigation of the Danube below Zernowoda, or as sometimes written Zarniboda.

Silistria or *Drystra*, in 44° 7′ N. lat., 27° 12′ E. long., 155 miles N.N.W. from Constantinople, is the capital of Silistria. The town is large, and defended by a citadel, a double line of walls, and other fortifications; but most of them are said to be in a state of neglect and decay. The city itself is ill built; the streets are narrow and crooked, and the houses low. The five mosques and the two public baths are meanly built, but at the eastern extremity of the town there is a custom-house in a better style of architecture. The large magazines which surround it contain chiefly corn and flour. The population amounts to 20,000.

The country called *Bulgaria*, of which Silistria forms a part, extends along the right bank of the Danube, from the Iron Gate to the mouth of the river in the Black Sea. It consists of a great inclined plane sloping northwards from the crest of the Emineh Balkan Mountains to the waterline of the Danube, and presents a fine, fertile, and in many parts well-cultivated country, divided into wide valleys by offshoots of the Balkan, and watered by the numerous feeders of the Danube. Bulgaria is now divided into the pashalics of Widin, Varna, Silistria, and Sophia, the last of which includes only a small portion of Bulgaria.

SI'LIUS ITA'LICUS, CAIUS. The place of this poet's birth is unknown. He studied oratory, in which Cicero was his model, and he aspired to be a poet after the fashion of Virgil. In A.D. 68, in the last year of Nero's reign, he was consul, and some time after he was governor of the province of Asia, which he is said to have administered well. He was a friend of Vitellius, who became emperor. On retiring to his estate in Campania he devoted himself to philosophy and poetry, and he enriched his villa with statues, paintings, and books. When old age brought infirmities with it, he ended his life by starvation, in which he followed the fashion of the time. His philosophy was the Stoical.

The only extant work of Silius is an epic poem on the Second Punic War, in seventeen books. His materials were chiefly taken from Livy and Polybius, and the work has something of historical value. It is a laboured composition, and the labour is very evident. His invention is poor. He falls short of Virgil in simplicity and clear-

ness, and he endeavours to produce effect by rhetorical ornaments and long-drawn descriptions. There is an edition of this poem by Drakenborch, Utrecht, 1717, and several others. It was translated into English by Thomas Ross, London, 1661, 1672, folio.

SILIVRI, a small seaport town of European Turkey, situated in 41° 4′ N. lat., 28° 16′ E. long., 32 miles W. from Constantinople, is built in the form of an amphitheatre, on the declivity of a hill, on the northern shore of the Sea of Marmara, and has 6500 inhabitants, many of whom are fishermen. The top of the hill is crowned by the ruins of a fort, which was built under the Greek empire. There are several mosques, and a market-place, which is much admired. The harbour admits only small vessels. The environs of the town are covered with vineyards and corn-fields. The ancient name is Selybria, often written Selymbria. It was a colony of the Megarians.

SILK. The manner in which raw silk is produced has already been described [BOMBYCIDÆ], and its value when wrought and manufactured has also been noticed. [RIBAND.] China was undoubtedly the country in which men first availed themselves of the labours of the silk-worm. Aristotle is the first Greek author who mentions the silk-worm ('Nat. Hist.,' v. 19); and he states that silk was first spun in the island of Cos, but the raw material was still an oriental product. For many centuries it was not known in Europe from what source silk was produced. It was not indeed until the sixth century that the obscurity which enveloped this subject was cleared up, by the successful result of a journey made by two Nestorian monks to China to unravel the mystery. The breeding of silk-worms in Europe was for six centuries confined to the Greeks of the Lower Empire. In the 12th century the art was transferred to Sicily; in the 13th century the rearing of silk-worms and the manufacture of silk were introduced into Italy, whence it was successively introduced into Spain and France, and in the 15th century the manufacture was established in England.

James I. was extremely solicitous to promote the breeding and rearing of silk-worms in England; but all attempts of this kind have failed both here and in the United States, partly from the unfitness of the climate, and partly from the high rate of wages, which renders this employment better adapted to the social condition of China, Italy, the south of France, and Malta, where the wages of labour have nearly reached their minimum. The production of raw silk is fast extending in British India, and the quality has been for some years gradually improving. The countries in which silk is produced are now very numerous.

Silk is obtained from the spider; not from the cobweb, but the silky thread which the female spider spins round her eggs. The silken fibres of the pinna form a strong and beautiful fabric; and some species of moths form cocoons which may be spun for curiosity, but not with a view to commercial profit.

Reeling from the cocoons is only performed in countries where the silk is produced. Silk reaches the weaver in three different states, in which it is called singles, tram, and organzine, the preparation of which is the business of the throwster. In plain silk-weaving the process is much the same as in weaving woollen or linen; but the weaver is assisted by a machine for the even distribution of the warp, which frequently consists of eight thousand separate threads in a breadth of twenty inches. The Jacquard-Loom, invented by a weaver of Lyon, has been the means of facilitating and cheapening the production of fancy or figured silks to an extraordinary extent. Patterns which required the greatest degree of skill and the most painful labour are produced by this machine by weavers of ordinary skill, and with but little more labour than that required in weaving plain silks. The power-loom has been only partially employed in the silk manufacture; and excepting for the commonest goods, it does not possess any great advantage over the hand-loom, as the delicacy of the material to be worked, and the attention which must be given to the process of the weft, frequently render it necessary to stop the machine.

Brocade and damask, the most sumptuous articles of silk manufacture a century ago, are now comparatively unknown. Persian, sarsnet, gros-de-Naples, ducapes, satin, and levantines, are the names given to plain silks, which vary from one another only in texture, quality, or softness. Satin derives its lustre from the great proportion of the threads of the warp being left visible, and the piece being afterwards passed over heated cylinders. Other varieties of silk goods are produced by mechanical arrangements in the loom, such as using different shuttles with threads of various substances, &c. The pile which constitutes the peculiarity of velvet is produced by the insertion of short pieces of silk thread, which cover the surface so entirely as to conceal the interlacings of the warp and woof. The process of weaving velvet is slow, and it is paid for at five times the rate of plain silks. There are several sorts of goods in which silk is employed with woollen materials, as poplins and bombazines.

The silk manufacture, after its introduction into England in the 15th century, remained for a long period one of the least important branches of the national industry. After the revocation of the edict of Nantes, in 1685, about 50,000 refugees fled to England, a large proportion of whom settled in Spitalfields, and carried on the silk manufacture. In 1692 the refugees obtained an exclusive patent for certain articles; and throughout the 18th century the Spitalfields weavers were constantly struggling to obtain a restrictive policy in respect to their manufacture. In 1824 a more liberal policy was introduced; and the silk trade has since greatly extended.

Ten years ago one-half of the silk manufactories were in Cheshire, next to which stood Lancashire, Somerset, Derbyshire, and Staffordshire; but Lancashire has recently advanced more than the other counties in this manufacture.

The British manufactured silk goods exported in 1847 amounted in value to 985,626*l.*; the

largest quantities were to the United States, 349,413*l.*; France, 171,763*l.*; and British America, 117,425*l.* The foreign manufactured silk goods imported in the same year, estimated by weight, amounted to 600,000 lbs. The exports in the year ending April 6, 1850, amounted in weight to 658,955 lbs.; besides 133,948 pieces of handkerchiefs; the duty on the former is 2*s.* to 14*s.* per lb.; ribbons bearing the highest duty; the duty on handkerchiefs is 5*s.* to 15*s.* per cent. in value. The total value of these exports was 1,000,357*l.*, and the amount of duty 225,889*l.* The silk imported in the year ending Jan. 5, 1850, was—raw silk, 4,991,472 lbs.; waste and knubs, 1,427,664 lbs.; thrown silk, 614,689 lbs.; total, 7,033,825 lbs.

SILK-WORM. [BOMBYCIDÆ.]

SI'LPHIUM. Ancient authors mention this plant and its juice. Two kinds of this substance are described. One kind, from Cyrene, was probably yielded by *Thapsia Silphium*, and the other was most likely assafœtida, which has been employed medicinally by Asiatics from very early times, though it has been known by this name in comparatively modern times.

SILURIAN SYSTEM. [GEOLOGY.]

SILU'RIDÆ, a family of fishes of the order *Malacopterygii*, placed by Cuvier, in his 'Règne Animal,' between the *Esocidæ*, or Pike tribe, and the *Salmonidæ*, or family of the Salmons; but in the 'Histoire Naturelle des Poissons,' the present group commences the *Malacopterygii*. The family *Siluridæ* constitutes a very extensive section of fishes, the species of which are for the most part confined to the fresh waters of warm climates. No group perhaps presents greater diversity of form than the Silurians, and their habits are equally interesting. Their most obvious external characters are—the want of true scales; the skin is generally naked, but in parts protected by large bony plates; the foremost ray of the dorsal and pectoral fins almost always consists of a strong bony ray, often serrated either in front or behind, or on both sides. These fishes moreover frequently are furnished with a small adipose fin on the hinder part of the back, as in the *Salmonidæ*. The mouth is almost always provided with barbules.

The genera are numerous. The only known European species is the *Silurus glanis* (Linn.), a fish of very large size, which is found in the lakes of Switzerland, the Danube, the Elbe, and most of the rivers of Hungary.

Mr. Yarrell observes, 'The Silurus is represented as sluggish in its habits, and a slow swimmer, taking its prey by lying in wait for it, in a manner somewhat similar to the Angler, *Lophius*, hiding itself in holes or soft mud, and apparently depending upon the accidental approach of fishes or other animals, of which its long and numerous barbules may be at the same time the source of attraction to the victims, and the means of warning to the devourer. From its formidable size, it can have but few enemies in the fresh water; and from them, its dark colour, in addition to its habit of secreting itself either in holes or soft mud, would be a sufficient security. In spring the male and female may be seen together, about the middle of the day, near the banks or edges of the water, but soon return to their usual retreats. The ova, when deposited, are green; and the young are excluded between the sixteenth and nineteenth days. 'The flesh of the Silurus is white, fat, and agreeable to many persons as food, particularly the part of the fish near the tail; but on account of its being luscious, soft, and difficult to digest, it is not recommended to those who have weak stomachs. In the northern countries of Europe the flesh is preserved by drying, and the fat is used as lard.'

SILVA Y FIGUERO'A, GARCIA DE, was born at Badajoz, in 1574. He entered the Spanish army early, and greatly distinguished himself in Flanders. In 1614 he was despatched by Philip III. on an embassy to Shah Abbas, king of Persia, to negociate for a treaty of commerce with Spain. But the negociation was unsuccessful, and Silva left Ispahan, Aug. 25, 1619, and returned to Goa, where he landed Nov. 1620. From Goa he sailed to Spain, where he died in 1628.

During his residence in Persia Silva wrote an itinerary of his travels, with an account of such events as came within his observation; and a sketch of the manners and customs of the inhabitants of that empire. This work was never printed in the original Spanish, though a French translation appeared in 1667, 'L'Ambassade de Don Garcias de Silva Figueroa en Perse,' Paris, 4to. It is one of the best accounts of Persia that we possess, and is much commended by Chardin. During his residence in Goa, Silva also made an abridgment of Spanish history, which appeared at Lisbon in 1628, 4to.

SILVER, a metal which has been well known and highly valued from the remotest period—circumstances which are readily explained by the facts of its occurring frequently native, and possessing great lustre and fitness for immediate use without being subjected to any metallurgic process.

Native Silver.—This occurs crystallised, arborescent or dendritic, capillary, reticulated, granular, and massive. The primary form of the crystal is a cube. Fracture, hackly. Colour white, but externally often blackish. Lustre metallic. Colour pure white. Streak shining. Opaque. Specific gravity 10.47. Malleable. It occurs in most parts of the world.

Ores of Silver.—The ores of silver are extremely numerous. Besides the *Native Silver* just described, the chief ores are the following:—*Antimonial Silver, Telluric Silver, Native Amalgam, Auriferous Native Silver, Arsenical Antimonial Silver, Horn Silver, Earthy Corneous Silver, Silver Glance, Earthy Silver Glance, Light Red Silver, Ruby Silver, Miargyrite, Biegsamer Silberglanz, Flexible Sulphuret, Brittle Sulphuret, Silberkupferglanz, Romelite, Brittle Silver, Selensilver, Eukairite, Selbite,* and *Ganzekothig-Erz.* Most of these are known by two or three names each; some occur only in irregular masses, the rest in crystals. The ores which yield silver most readily and most abundantly are native silver, horn silver (chloride), and silver glance (sulphuret). Silver is also procured by cupellation. [LEAD, vii., 896.]

Properties of Silver.—Silver has a purer white colour than any other metal; it has great brilliancy; and is susceptible of a high polish. Its specific gravity is about 10.4 when cast, and 10.5 to 10.6 when stamped or rolled. It is sufficiently soft to be cut with a knife. It is very malleable and ductile, so that it may be beaten into leaves about 1–10,000th of an inch in thickness, and drawn into wire much finer than a human hair. It does not rust or oxidise by exposure to the air, but when the air contains sulphureous vapours it tarnishes, becoming first yellowish and afterwards black. Three metals only, viz. iron, copper, and platinum, exceed silver in tenacity; a wire $\frac{1}{8}$ of an inch in diameter supports rather more than 187 pounds without breaking. When exposed to a bright red heat silver melts, which, according to Daniell, is equivalent to 1873° of Fahrenheit; on fusion its appearance is extremely brilliant, and during this it absorbs oxygen from the air to the amount of about twenty-two times its volume, and this it gives out either by cooling or being poured into water. When leaf-silver, or fine silver wire, is heated by voltaic electricity, it burns with a fine green flame; if intensely heated in the open fire it boils, and a portion is vaporised.

Oxygen and *Silver* form three compounds. The *Protoxide* ($S^1 O^1$) is of a brownish colour, inodorous, tasteless, very slightly if at all soluble in water; it is decomposed by the action of light. It gives a yellow colour to glass and porcelain, and is the oxide which is the basis of all the common salts of silver. The *Suboxide* ($S^2 O^1$) seldom forms salts with acids. The *Peroxide* ($S^1 O^2$) appears in minute acicular crystals.

Chlorine and *Silver* readily combine; they form one of the ores of silver, and they may also be readily combined by artificial means. The chloride (S^1 Chl.^{1}) is perfectly white, but by exposure to daylight it becomes slowly bluish-white, and eventually almost black. The direct rays of the sun produce this effect almost instantaneously. On this property is founded its use in photogenic drawing. By mere heat it undergoes no change except fusion, and when it has solidified on cooling it has the appearance of horn; hence the name of Horn Silver for the native chloride. It is largely and advantageously used in experimental chemistry.

Fluorine and *Silver* may be combined to form a fluoride ($S^1 F^1$). *Sulphur* and *Silver* combine to form a sulphuret (S^1 Su.^{1}), which occurs both as an ore and as a chemical product. *Phosphorus* and *Silver* combine when heated together, and form a white brittle phosphuret ($S^1 P^1$); when fused and exposed to the air it loses phosphorous. *Iodine* and *Silver* combine to form an iodide ($S^1 I^1$), which has a greenish-yellow colour: it is insoluble in water or ammonia, and decomposed when heated with potash; when fused, it acquires a red colour, and is discoloured by light. In the Daguerreotype, a film of this compound, on the surface of a polished plate of silver, is the substance that receives the impression of light.

The *Oxides of Silver* combine with a great number of substances. The protoxide forms with ammonia a compound called *Fulminating Silver*, on account of the facility and violence with which it explodes; in exploding it forms water, sets free nitrogen, and metallic silver remains. A very gentle heat or slight friction causes it to explode, sometimes even before it is dry.

The principal acids form important salts with the protoxide of silver. *Nitrate of Silver* (S^1 Acid^1) has a bitter metallic taste, is soluble in about its own weight of water at 60°, and in half its weight of boiling water. By the action of light, especially when in contact with organic matter, nitrate of silver is rendered of a dark colour, and is then insoluble in water. When moderately heated, nitrate of silver fuses, and being then cast in a mould in small cylindrical sticks, it constitutes the Argenti Nitras of the Pharmacopœias, commonly called *Lunar Caustic*. When sulphur, phosphorus, or charcoal, is mixed with nitrate of silver, and struck on an anvil, detonation ensues, and metallic silver is obtained. Nitrate of silver is employed by precipitation with carbonate of soda, &c., for writing on linen: it is commonly called Indelible Ink.

Chlorate, Carbonate, Sulphate, Sulphite, Hyposulphate, Hyposulphite, Phosphate, Pyrophosphate, Benzoate, Acetate, Citrate, Oxalate, Cyanide, Ferrocyanide, Cyanate, Fulminate, &c., of silver, are among the numerous salts of this metal. For the most part they consist of one equivalent of oxide and one of acid. One of the most remarkable is *Fulminate of Silver*, so named on account of its great explosive power. It is a grayish-white crystalline powder, which becomes darker by exposure to light. In the quantity even of half a grain it detonates violently, either by the action of heat, electricity, strong sulphuric acid, or friction. When placed on one flint, and slightly touched with another, explosion also takes place. It has been known to detonate with great violence when a little has remained between a stopper and the neck of a bottle, on screwing in the stopper. It should be preserved therefore in small portions, in paper, in a wide-mouthed corked vial.

Alloys of Silver.—Little or nothing is known respecting the alloys of silver with the following metals:—Potassium, sodium, and the metals of the alkaline earths, manganese, cadmium, nickel, uranium, tellurium, titanium, cerium, chromium, and vanadium.

Iron and silver combine with difficulty. They separate on cooling, the iron retaining about one-eightieth of silver, and the silver about one-thirtieth of iron. According to Faraday and Stodart, steel containing about one five-hundredth of silver forms a good alloy for cutting instruments. Iron and silver form a bluish-white granular alloy; tin and silver a white, hard, brittle alloy. When cobalt and silver are fused together, they separate during cooling, each retaining a portion of the other. Lead and silver give a dull brittle alloy; antimony and silver a white brittle alloy; arsenic and silver form a gray, brittle, granular compound, containing about 14 per cent. of the former metal. Bismuth and silver give a yellowish-white, brittle, lamellar alloy; molybdenum forms a compact, brittle, gray, granular com-

pound with silver; and tungsten a brown, slightly malleable button: copper and silver readily combine, and the silver is rendered harder by it without much deterioration of colour; the standard silver of this country is composed of 11.10 silver and 0.90 copper. Mercury and silver amalgamate readily, and this compound is sometimes employed for plating, but this operation is now most advantageously carried on by precipitation by means of voltaic electricity.

Production, &c., of Silver.—Silver-ores are found chiefly in veins which traverse the primary and the older of the secondary stratified rocks, but especially the former; and also the unstratified rocks, such as granite and porphyry, which are associated with the above. Some of the richest mines in South America are situated in primary strata; also in limestone and in grauwacke, and in still more secondary strata. In some of the mines in Peru, and in those of Kongsberg in Norway and Freiburg in Saxony, silver has been discovered in masses weighing from 100 to 800 lbs. In the mines of Europe the veins are numerous and slender. In some of the mines in the Harz Mountains and in the Hungarian mines the veins occur in a small number of spots, and are of considerable dimensions. In three of the richest districts of Mexico there is only one principal vein, which is worked in different places. One of these veins, in the district of Guanaxuato, is from 130 to 148 feet wide, and it has been traced and worked to an extent of nearly eight miles.

In Mexico there were 500 mining establishments, called *Reales*, at the time of Humboldt's visit, and from 3000 to 4000 veins or masses were worked. The average richness of all the ores in Mexico is from 3 to 4 ounces per quintal of 102 lbs. In one of the Mexican mines a working of one hundred feet in length yielded in six months 432,274 lbs. troy of silver, equal in value to about 1,000,000*l*. In Chili some of the mines yield only 8 ounces in 5000 lbs. of ore; but in the rich mine of Copiapo, discovered in 1832, the ore frequently contains 60 or 70 per cent. of silver. The average produce of the mines in Saxony is from 3 to 4 ounces in the quintal. The lead mines of Craven in Yorkshire contained 230 ounces per ton; and those of Cardiganshire, worked in the reign of Charles I., yielded 80 ounces. The average proportion of the lead-mines of the north of England is 12 ounces per ton. Even when the proportion of silver is so low as 8 ounces, or one grain per ¼ lb., it has been found profitable to separate it. The produce of the Mexican mines averaged annually 4,800,000*l*. from 1793 to 1803, of which nineteen-twentieths were silver. In the first ten years of the present century the average annual value was about 5,000,000*l*., the quantity of pure silver annually produced in that time being 1,440,650 troy lbs. The mines of Potosi in Peru are the most famous in South America. [Potosi.] The produce of the Chilian mines in 1832 was about 1,000,000 ounces. At the commencement of the present century Humboldt estimated the annual produce of the silver-mines of Chili, Peru, Buenos Ayres, and New Grenada, at nearly 700,000 lbs. troy, valued at 2,074,476*l*. sterling. The proportion of silver to gold produced from all the American mines was, early in the present century, as 62 to 1; and from the mines of all countries as 52 to 1.

The most productive mines in Europe are those in Saxony, Austria, Hungary, Norway, Russia, and Spain; but nearly all of these are less productive than they have been in former ages. The quantity found in Great Britain is extremely small. Silver has ceased to be abundant in Asia, except perhaps in China. In Africa none is met with.

Gold and silver appear to have been in request from the earliest ages. Abraham was rich in silver and in gold. Joseph, his great-grandson, was sold by his brethren for twenty pieces of silver; and when afterwards they went to Egypt to purchase corn, they brought 'silver in their sacks' mouth.' In the book of Job (xlii., 11-12), we read of silver passing from hand to hand as money. It is said (1 Kings, x.) that in the days of Solomon silver was nothing accounted of, and that 'the king made silver to be as stones in Jerusalem.' Darius Hystaspes, king of Persia, annually collected 9880 talents of silver, besides gold, as tribute from Asia and Africa; subsequently tribute came in also from the islands of the Mediterranean and from Europe as far west as Thessaly. Herodotus states (iii., 96) that the gold and silver were melted and poured into earthen vessels, and that the earthen vessels were then removed, which left the metal in a solid mass: when any was wanted, a piece was broken off as the occasion required.

The proportional value of gold to silver was 12 and 10 to 1 from the Anglo-Saxon times to the discovery of America; it is at present 14.28 to 1. In ancient Greece the proportion varied from 15 and 10 to 1, and in Rome from 12 and 7 to 1. Herodotus (iii., 95) estimates it at 13 to 1. Since the discovery of America the proportion throughout the world has been between 17 and 14 to 1. The English silver coinage from 1600 to 1800 amounted to about 26,000,000*l*.; from 1800 to 1840 about 11,000,000*l*. In 1847 about 38,000 lbs. of silver was coined at the Mint. The silver bullion received at the Bank in that year amounted to 1,200,000 lbs.; and the quantity delivered 1,600,000 lbs.

There are nine mints in Mexico, at which the coinage was as follows in the years named.

	Dollars.	£
1842 . .	984,427 . .	196,885
1843 . .	620,532 . .	124,106
1844 . .	726,762 . .	145,352
1845 . .	783,910 . .	156,782
1846 . .	915,752 . .	183,150

When silver is issued for coin, it is always alloyed with copper: the maximum of hardness is produced by one-fifth of copper. One lb. of standard silver of the English coinage contains 11 oz. 2 dwts. of pure silver and 18 dwts. alloy, or 925 parts of pure silver in 1000 parts of standard silver. For purposes connected with the manufacture of various articles of use and ornament, the alloy is greater. At Birmingham rolled sheets are made which do not contain more than

3 or 4 dwts. of silver to each lb. of the inferior metal.

Mr. Jacob estimates the annual consumption of silver in the United Kingdom at 3,282,046 oz., valued at 820,521*l.* He distributes it as follows:—

That paying duty . .	1,275,316 oz.
That used in watch-cases .	506,740
That used in plating .	900,000
That for other minor purposes	500,000
	3,282,046

The value of the stock of silver in the hands of the manufacturers and dealers is estimated by the same authority at 3,280,000*l.* The value of ornaments and utensils of the precious metals in Europe and America, if brought to the crucible, Mr. Jacob values at 400,000,000*l.*, or one-fourth more than the value of the coined metals; but Mr. M'Culloch thinks these estimates too high.

Medical Properties of Silver.—In a purely metallic state silver has no action on the animal frame, and the only salt much used is the nitrate, termed also *Lunar Caustic.* When nitrate of silver is brought in contact with any part of the human frame, it causes first a white mark, which gradually changes to blue, purple, and at last to black. This occurs more rapidly if moisture be present; and it is owing to a chemical combination of the metal with the albumen and fibrin of the animal tissues. If the part be wetted, and the caustic applied several times at short intervals, vesication results. Nitrate of silver acts therefore locally as an *irritant* and *corrosive.* When taken internally in small doses for a considerable time, such as six or twelve months, it is absorbed and deposited in various parts of the body, and when it is deposited in the rete mucosum of the skin it causes discolourations, which in most cases prove permanent. It has been employed frequently with success, but often with failure, in the treatment of epilepsy, chorea, &c., but should always be used with caution.

The external employment of this agent is not liable to any objection when used cautiously, while its advantages are very great. It is the most powerful *direct antiphlogistic* agent known. All subacute inflammations in any part to which it can be immediately applied will subside under its influence. In inflammations not merely of the skin, but of mucous membranes, when they occur in parts which are accessible, its influence is great, and speedily manifested.

When a solution of nitrate of silver is made, distilled water should invariably be used. Oxide of silver has been recently strongly recommended as not liable to the objections which attach to the nitrate.

SILVER, GERMAN. [COPPER, iv., 919.]

SILVER-GRAIN. In making a horizontal section of the trunk of any tree, a number of straight lines will be seen radiating from the central pith through the wood to the bark. These rays are called by botanists medullary rays or plates, and by persons who work on wood Silver-Grain. They are composed entirely of cellular tissue, which is of a compressed form, and thence called muriform, and often do not consist of more than a single layer of cells, although in some trees, as *Aristolochias*, the layers are very numerous. In longitudinal sections of the stem they give it a remarkable satiny lustre, which constitutes the great beauty of some woods, as the plane-tree and sycamore.

SILVERING. [ELECTRO-METALLURGY.]

SILVIC ACID, a substance which, with Pinic Acid, constitutes the greater portion of colophony, or common rosin. Silvic acid melts below 212°; is insoluble in water, but dissolves readily in hot alcohol and in æther, and is precipitated by water; it is soluble also in all proportions in the volatile and fixed oils. It may be regarded as an oxide of oil of turpentine; its composition is supposed to be represented by $C^{52}\ O^{5}\ H^{40}$.

SI'LYBUM, a genus of composite plants belonging to the tribe *Cynareæ* and the section *Silybeæ*. *S. marianum* is the only species. It is found in waste places in Great Britain.

SIMARU'BA is the bark of the root of the *Simaruba amara, S. officinalis* of 'Pharmacop. Lond.,' a tall tree, native of Guiana, and also of Jamaica, if the tree found in that island be not a distinct species. Its chief constituents are quassite, resin, a volatile oil having an odour like benzoin, ulmin, mucilage, and some salts. It is tonic and demulcent in small doses, and therefore useful in the later stages of dysentery, but in larger doses it is emetic. The bark of the root of *Simaruba versicolor* is much like that above described, and is used externally by the Brazilians as a wash to ill-conditioned ulcers, and to destroy vermin; but if taken internally it causes stupor and other narcotic symptoms; it should therefore be carefully distinguished from the former.

SIMARUBA'CEÆ, a natural order of plants belonging to the gynobasic group of Polypetalous Exogens. The plants of this order are trees or shrubs. They are all intensely bitter. The Quassia on this account is used in medicine. [QUASSIA.] *Simaruba versicolor* is so bitter that no insects will attack it; and when all other specimens of plants in dried collections have been attacked by Ptini, &c., specimens of this plant have been left untouched.

SIMBIRSK, a government of European Russia, is bounded N. by Kasan, E. by Orenburg, S. by Saratow and Pensa, and W. by Nischnei-Novgorod. The area is 27,825 square miles, and the population in 1846 was 1,318,900. The surface is in general an undulating plain, but on the right bank of the Volga there is a range of hills, which rise to the height of 400 feet. The principal river is the Volga, which runs out of Kasan, about the middle of the northern frontier, in a direction nearly south to Stavropol, where it turns to the east; being joined by the Sok, coming from Orenburg, it turns southwards as far as Samara, where it flows due west as far as the town of Syzran, when it again turns to the south. All the rivers belong to the system of the Volga, which receives on the right the Ousa and the Syzran, and on the left the Tcheremchan, the Sok after its junction with the Kandoustcha, and the Samara. The Sviaga, running parallel to the

Volga from south to north, joins that river in the government of Kasan; and the Soura, which is navigable in spring, coming from Pensa, traverses the western part of the government, and joins the Volga in the government of Nischnei-Novgorod. The lakes are numerous, but small. The climate is generally healthy; but the winter is very cold, and the summer very hot. The Volga is usually frozen for five months in the year.

The soil is generally fertile, consisting of a good black mould, which requires no manure. It is pretty carefully cultivated, and produces more corn than is wanted for the home consumption: the principal species of grain are rye, wheat, and spelt; but there are likewise oats, barley, millet, and buckwheat. The inhabitants cultivate also the poppy, peas, lentils, flax, much hemp, tobacco, and some potatoes. Only the most ordinary kinds of potherbs are grown; and the fruit is of bad quality. In the northern parts of the government there are extensive forests; but in the south they scarcely suffice for the supply of the inhabitants. Though there are good pastures, the breeding of cattle is not much attended to, except among the Calmuck Tartars. The rich Calmucks have large numbers of horses, oxen, and sheep. The Tartars apply themselves to agriculture with great success. Game is pretty abundant, but the fur-bearing animals are scarce. The fisheries of various kinds in the Volga are productive. The minerals are alabaster, sulphur, limestone, and some iron.

The manufactures, which are unimportant, consist of woollen cloths, blankets, carpets, sail-cloth, leather, some silk and nankeen, glass, soap, candles, and brandy. The exports consist of horses, oxen, hemp, apples, water-melons, in good years corn, fish, tallow, leather, hides, and millstones.

Simbirsk, the capital of the government, is situated partly in a fertile plain on the right bank of the Volga, and partly on a hill, behind which flows the Sviaga in a direction contrary to that of the Volga; so that the city is on the right bank of each of these rivers, though they unite only at a distance of 105 miles north of it. The town is not regularly built, but there are some broad and straight streets. Almost all the houses are of wood. The churches, 16 in number, are all of stone, except one, which is of wood. There are two monasteries, a gymnasium, manufactories of candles and soap, and some tanneries. The population amounts to 18,000. *Syzran*, at the junction of the Syzran with the Volga, has 7100 inhabitants. *Samara*, on the left bank of the Volga, near 50° E. long., is a trading town, with 5000 inhabitants. *Stavropol*, the chief town of the Calmucks, on the right bank of the Volga, was built about the year 1737. In the centre is a fort, surrounded with palisades, which is the residence of the chief of the Calmucks. The Russian garrison is in the upper town. The population is about 3000.

SIMEON OF DURHAM, an English historical writer, who lived about the beginning of the 11th century. He was a teacher of mathematics at Oxford, and was afterwards precentor in Durham Cathedral. He wrote a history of the kings of England from 616 to 1130. The work was continued to 1156 by John, prior of Hexham. Simeon of Durham is supposed to have died soon after 1130, when his history terminates. This work is included in Twysden's 'Anglicanæ Historiæ Scriptores Decem.' Simeon also wrote a history of Durham Cathedral, which was published in 1732, 'Historia Ecclesiæ Dunhelmensis, cui præmittitur T. R. Disquisitio de Auctore hujus Libelli: edidit T. Bedford,' Lond., 1732, 8vo.

SIMFEROPOL (*Akmetchet*), the seat of the Russian government of Taurida, is situated in 45° 57′ N. lat., 34° 6′ E. long., on an elevated plateau above the river Salgir. The old town of Akmetchet now forms the Tartar quarter; but Simferopol, properly so called, is a modern town. The Russians, on taking possession of the country, left the old capital of Baktchiserai to the Tartars, and built at Simferopol a capital according to their own taste, with immensely long and broad streets, in which horse-races might be held without interrupting the usual traffic. Being near the centre of the peninsula, it is well calculated for the seat of government. There are many pretty houses, with iron roofs painted green and adorned with columns. Besides the government offices, there are a Russian church, a German church, one Greek and one Armenian church, four Tartar chapels, a gymnasium, and a seminary for schoolmasters. The population is about 9000. The town has no manufactures of importance. During the hot season fevers are very prevalent, and the water is bad.

SI'MIADÆ, the name of a quadrumanous family of mammals. [APE; ATELES; BABOON; CHEIROPODA; CHIMPANZEE; HYLOBATES; LAGOTHRIX; MYCETES; NASALIS; ORANG-UTAN; QUADRUMANA; SAKIS; SAPAJOUS; SEMNOPITHECUS, &c.]

SIMILAR, SIMILAR FIGURES (Geometry). Similarity, resemblance, or likeness, means sameness in some, if not in all, particulars. In geometry, the word refers to a sameness of one particular kind. The two most important notions which the view of a figure will give are those of size and shape, ideas which have no connection whatsoever with each other. Figures of different sizes may have the same shape, and figures of different shapes may have the same size. In the latter case they are called by Euclid *equal*, in the former *similar* (similar figures, ὅμοια σχήματα). The first term, in Euclid's first use of it, includes united sameness, both of size and shape; but he soon drops the former notion, and, reserving equal to signify sameness of size only, introduces the word similar to denote sameness of form: so that the equality of the fundamental definition is the subsequent combined equality and similarity of the sixth book.

Similarity of form, or, as we shall now technically say, similarity, is a conception which is better defined by things than by words; being in fact one of our fundamental ideas of figure. A drawing, a map, a model, severally appeal to a known idea of similarity, derived from, it may be, or at least nourished by, the constant occurrence in nature and art of objects which have a general though not a perfectly mathematical similarity.

The rudest nations understand a picture or a map almost instantly. We may observe that errors or monstrosities of size are always more bearable than those of form, so much more do our conceptions of objects depend upon the form than the size. A painter is even obliged to diminish the size of the minor objects of his picture a little, to give room for the more important objects; but no one ever thought of making a change of form, however slight, in one object, for the sake of its effect on any other.

Granting then a perfect notion of similarity, we now ask in what way it is to be ascertained whether two figures are similar or not. To simplify the question, let them be plane figures, say two maps of England of different sizes, but made on the same projection. It is obvious, in the first place, that the lines of one figure must not only be related to one another in length in the same manner as in the other, but also in position. Let us drop for the present all the curved lines of the coast, &c., and consider only the dots which represent the towns. Join every such pair of dots by straight lines: then it is plain that similarity of form requires that any two lines in the first should not only be in the same proportion, as to length, with the two corresponding lines in the second, but that the first pair should incline at the same angle to each other as the second.

We have hitherto supposed that both circumstances must be looked to—proper lengths and proper angles—truth of linear proportion and truth of relative direction. But it is one of the first things which the student of geometry learns (in reference to this subject), that the attainment of correctness in either secures that of the other. If the smaller map be made true in all its relative lengths, it must be true in all its directions; if it be made true in all its directions, it must be true in all its relative lengths.

It would be most natural to take ratios only, or else angles only. Perhaps the latter would be best. Euclid confines himself to neither, in which he is guided by the following consideration:—He uses only salient or convex figures, and his lengths, or sides, are only those lines which form the external contour. The internal lines or diagonals he rarely considers, except in the four-sided figure. He lays it down as the definition of similarity, that all the angles of the one figure (meaning only angles made by the sides of the contour) are equal to those of the other, each to each, and that the sides about those angles are proportional.

SI'MILE is defined by Johnson to be 'a comparison by which anything is illustrated or aggrandised.' A Metaphor differs from a Simile in expression, inasmuch as a metaphor is a comparison without the words which indicate the resemblance, and a simile is a comparison where the objects compared are kept as distinct in expression as in thought. Similes are usually misplaced in passionate poetry, but metaphors constitute the very language of passion; for the mind, when moved, catches at every slight association to express itself, but never dwells on them with the deliberateness of a comparison.

SIMON MACCABÆUS, or MATTHES, surnamed Thasi, was the second son of Mattathias, and brother of Judas Maccabæus and Jonathan Apphus. Mattathias, when dying, recommended him to his brethren as their counsellor (1 Macc., ii. 3). He distinguished himself on several occasions during the lives of Judas and Jonathan. (1 Macc., v. 17; x. 74; 2 Macc., viii. 22; xiv. 17.) Under Jonathan he was made, by Antiochus Theos, governor over the coast of the Mediterranean from Tyre to the frontier of Egypt (1 Macc., xi. 59); and here he took the fortified towns of Bethsur and Joppa, and founded Adida, in the plain of Sephela. (1 Macc., xi. 65; xii. 33, 38.)

After the treacherous seizure of Jonathan by Trypho [JONATHAN APPHUS], Simon was chosen by the people as their chief (1 Macc., xiii.); and, according to Josephus ('Antiq.,' xiii. 6, 6), as high-priest also. Under his rule, the Jews became once more free and independent, and they began to reckon from this period (170 Aer. Seleuc.; 143-142, B.C.) a new civil æra, which is used on the coins of Simon as well as by Josephus and the author of the 'First Book of Maccabees' (1 Macc., xiii. 41). The last remains of their bondage to the Syrians were removed in the next year by the surrender of the Syrian garrison in the citadel of Jerusalem.

Simon, in the course of a tour which he made for the purpose of inspecting and improving the country, visited his son-in-law Ptolemæus, at his castle of Doc, where he and his two sons Mattathias and Judas were treacherously put to death by Ptolemæus, who aimed at the principality of Judæa (B.C. 135). He was succeeded by his surviving son, John Hyrcanus. [HYRCANUS, JOHN; ASMONÆANS; MACCABEES.]

The coinage of Simon is the first of which we have any historical account among the Jews.

SIMON MAGUS, that is, the Magician, is mentioned in the 'Acts of the Apostles' as having imposed upon the people of Samaria by magical practices. There are many marvellous legends about his life and doctrines, for which see Calmet's 'Dictionary,' &c.

SIMON, RICHARD, was born at Dieppe, in Normandy, May 13, 1638. After he had finished his studies, he entered into the Congregation of the Oratory, and became lecturer on philosophy at the College of Juilly. Being summoned by his superiors to Paris, he applied himself to the study of divinity and oriental learning. In 1668 he returned to Juilly, and resumed his lectures on philosophy, and two years after published his defence of a Jew whom the parliament of Metz condemned to be burned on the charge of having murdered a Christian child. In the following year, with a view to show that the opinions of the Greek church are not materially different from those of the Church of Rome with respect to the Sacrament, he published his 'Fides Ecclesiæ Orientalis,' Paris, 1671, 8vo., and 1682, 4to. This work, which is a translation of one of the tracts of Gabriel, metropolitan of Philadelphia, with notes, Simon gave as a supplement to the first volume of the 'Perpetuity of the Faith

respecting the Eucharist,' whose authors he accused of having committed many gross errors, and not having sufficiently answered the objections raised by the Protestant minister Jean Claude, in his 'Réponse au Traité de la Perpétuité de la Foi sur l'Eucharistie.' This involved him in a controversy with the writers of Port-Royal, and laid the foundation of that opposition which he afterwards met with from the learned of his own communion. His next publication, which came out under the assumed name of Recared Simeon, was a French translation of the work of Leo of Modena: 'Cérémonies et Coutumes qui s'observent aujourd'hui parmi les Juifs,' Paris, 1674, 12mo. A second edition appeared in 1681, under the name of the Sieur de Simonville. But the work which rendered him most famous is his 'Histoire Critique du Vieux Testament,' which immediately after its publication (Paris, 1678, 8vo.) was suppressed on the ground that it contained doctrines dangerous to religion and the church. The work however was so much admired, that it was reprinted the year after, and translated into Latin at Amsterdam, 1681, and into English at London, 1682, 4to., by John Hampden. In 1684 he published at Frankfort, 'Histoire de l'Origine et du Progrès des Revenues Ecclésiastiques,' under the name of Jerome à Costa, of which a second edition appeared at the same place in 1709, in 2 vols. 8vo. In the same year (1684) he printed in London his 'Disquisitiones Criticæ,' &c., which was immediately translated into English. In 1688 he published at Frankfort, under the name of John Reuchlin, 'Dissertation Critique sur la Nouvelle Bibliothèque des Auteurs Ecclésiastiques par Du Pin,' in which he defends some opinions contained in his 'Histoire Critique,' which had been controverted by Du Pin. His next publication was 'Histoire Critique du Nouveau Testament,' Rotterdam, 1689, 4to., an English version of which appeared the same year at London. Simon was a man of profound learning and great acuteness; but a love of controversy, and too great a propensity to depreciate and abuse those who did not acquiesce in his opinions, rendered him equally obnoxious to Protestants and Roman Catholics. He died at Dieppe, in April, 1712.

SIMO'NIDES was a native of Iúlis, in the island of Ceos, and was born about B.C. 556. He appears to have removed to Athens about B.C. 525, where he was well received by Hipparchus, and became acquainted with Anacreon and Lasus. After the murder of Hipparchus, he took refuge with the Aleúadæ and Scópadæ in Thessaly, whose praises he celebrated in some of his poems. After the battle of Marathon, B.C. 490, he was again at Athens. After the banishment of Themistocles and the death of Pausanias, with both of whom he lived on intimate terms, he retired to Hieron's court at Syracuse, where he died, B.C. 467.

Most of the poems of Simonides are lost; but we can judge of his merits by the little that remains. He was one of the most distinguished of the elegiac poets, and particularly excelled in the pathetic, as we see in his 'Lament of Dánae' and other of his poetical fragments. Some of his best pieces are his 'Epigrams,' or short inscriptions. [EPIGRAM.] One of the most celebrated of them is that upon the Spartans who fell at Thermópylæ (Herod., vii. 2.) 'Stranger, tell the Lacedæmonians that we lie here in obedience to their commands;' and another on the Athenians who fell at Marathon. The remains of Simonides have been published by Schneidewin, 1835, 8vo., and by Bergk, in his 'Poetæ Lyrici Græci,' 1843.

Simonides of Amorgus lived in the first part of the seventh century B.C. He wrote satirical iambics, the fragments of which have been collected by Welcker, Bonn, 1835.

SIMONY is the buying or selling for money or other corrupt consideration any ecclesiastical benefice, dignity, or preferment, or the causing a clerk to obtain or to relinquish such benefice or preferment for corrupt consideration. The word is derived from Simon, who is mentioned in the Acts of the Apostles (viii. 18-24) as having offered money to Peter and John in order that he might obtain from them apostolical powers.

Whether Simony was an offence at common law is at least doubtful. But it is an ecclesiastical offence by the canons both of the Roman Catholic and of the Anglican church. The 40th canon of the latter (A.D. 1603), 'to avoid the detestable crime of Simony,' and because the buying and selling of spiritual and ecclesiastical functions, &c., 'is execrable before God,' prescribes an oath to be administered to every person assuming such offices, by which he denies that he has made any Simoniacal payment, contract, or promise, directly or indirectly, for procuring such ecclesiastical office, or that he will perform any such contract made on his behalf without his knowledge.

But the offence now depends on the statute 31 Elizabeth, c. 6, although the word Simony is not mentioned in the act. [BENEFICE, iii. 168.]

Notwithstanding the indignation of ecclesiastical authorities against Simony, trafficking in ecclesiastical preferment is very common. Indeed, if the qualification of persons for holy orders is carefully investigated before their admission to the ministry, and the discipline of the church can be enforced by the bishops and other ecclesiastical authorities, the reason why a minister who has been admitted to a benefice for a pecuniary consideration should be disqualified for his office is not very obvious, especially in a country where advowsons are by law a marketable commodity, and a bargain for compelling a minister to resign a benefice in favour of another person, provided the latter is within certain degrees of consanguinity to the patron, is a legal contract. [ADVOWSON.]

(Roger's *Ecclesiastical Law*; Bacon's *Abridgment*, 'Simony.')

SIMOON. [SAMIELI.]

SIMPLE CONTRACT Debts are those which are contracted without any engagement under the seal of the debtor or of his ancestor [DEED], and which are not of record by any judgment of a court. Money due for goods bought by the debtor is the most usual of simple contract debts. Simple contract debts are the last which are payable out of a deceased person's estate, when the assets are insufficient.

SIMPLICIUS, a native of Cilicia, born in the time of the Emperor Justinian. He spent the greater part of his life at Athens, and died there.

Simplicius wrote Commentaries on Aristotle's 'Categoriæ,' 'Physica,' 'De Cœlo,' and 'De Anima.' They are the most valuable of all the extant Greek commentaries on Aristotle; for Simplicius possessed a profound knowledge of his author, as well as of other philosophical writers; and he frequently quotes the opinions of philosophers whose works are no longer extant. His commentaries are printed in some of the early editions of Aristotle; they are also contained in 'Scholia in Aristotelem, collegit Ch. A. Brandis,' Berlin, 1836, &c.

Simplicius also wrote a Commentary on the 'Enchiridion' of Epictetus. The best separate edition of this commentary is that by Schweighæuser, with a Latin translation, in 2 vols., Leipzig, 1800. It has been translated into English by Dr. G. Stanhope, London, 1704, 8vo.; into French by Dacier, Paris, 1715; and into German by Schulthess, Zürich, 1778.

SIMPLI'CIUS, a native of Tibur, succeeded Hilarius as bishop of Rome (467). He dedicated several churches at Rome to particular saints, and framed several regulations concerning the discipline of the clergy. He died 483.

SIMPSON, THOMAS, a distinguished English mathematician, was born at Market-Bosworth in Leicestershire, August 20, 1710. He appears even in his boyhood to have had a strong inclination for acquiring information by reading and conversation; but his father, who was a weaver, intending that he should follow that occupation, endeavoured to divert him from a pursuit which interfered with the labour of his hands. The impulse of genius however prevailed over the remonstrances of the parent, and the youth, having quitted his father's house, went to reside at Nuneaton, where, in the exercise of his trade, he obtained the means of subsisting, and during the intervals of leisure he indulged his taste for the acquisition of knowledge.

Young Simpson was led to the study of mathematics by having accidentally obtained possession of a copy of Cocker's 'Arithmetic.' It is added that an itinerant pedlar and fortune-teller instructed him at the same time in the mysteries of judicial astrology, and this art he occasionally practised during several years.

While yet a stripling he married a woman about fifty years of age, the widow of a tailor and the mother of two children, of whom the younger was his senior by two years; all the family however appear to have lived together in harmony, Simpson working at his trade by day, and increasing his income by keeping a private school in the evenings. In 1733 he went to reside at Derby, where he continued to follow the united avocations of weaver and schoolmaster, and where he found means to increase his knowledge of mathematics. With arithmetic, geometry, and algebra, he was already acquainted; and now, having obtained a loan of Stone's translation of the Marquis de l'Hôpital's 'Analyse des Infinimens Petits,' he was enabled by the force of genius and unremitting application to make himself master of the direct and inverse method of fluxions. Being thus qualified, he began in or before the year 1735 to write answers to the mathematical questions in the 'Ladies' Diary,' and even to propose questions for solution in that work.

In the year 1735 or 1736 Simpson came to London and took lodgings in Spitalfields, where at first he both worked at the loom and gave instruction.

On the death of Dr. Derham, Mr. Simpson was, in 1743, appointed professor of mathematics in the Royal Military Academy at Woolwich; and this post he held during nearly all the rest of his life.

In 1746 he was admitted a fellow of the Royal Society, and on account of the mediocrity of his circumstances he was excused the payment of the admission fee and the annual subscriptions: several of his mathematical papers were printed in the 'Transactions,' but most of them were afterwards republished in the volumes of his works. In 1760, when the present bridge at Blackfriars was about to be built, Mr. Simpson was consulted with other mathematicians concerning the form which would be most advantageous for the arches; he appears in consequence to have taken some pains in investigating the conditions of the stability of vaults, and to have given the preference to those of a hemi-cylindrical form, but he did not live to complete the work, and the results of his researches have never been made public.

As Mr. Simpson advanced in life, he became gradually a prey to melancholy, which appears to have been increased by the influence of bad habits; his mental faculties were at length so far impaired that he became incapable of performing the duties of his professorship, and in the beginning of the year 1761 he was prevailed on to retire to his native town. The fatigues of the journey increased his disorder, and he died May 14, 1761, in the 51st year of his age.

For a list of Simpson's works, &c., see his Life in the 'Penny Cyclopædia.'

SIMSON, ROBERT, was a son of Mr. John Simson, of Kirton Hall in Ayrshire, and was born in October, 1687. About the year 1701 he was sent to the University of Glasgow, where he acquired that proficiency in the learned languages which he retained during all his life, and at the same time he made considerable progress in moral philosophy and theology, being destined by his father for the church. Young Simson soon however found a pursuit more congenial to his taste in the study of mathematics, and chiefly of the ancient geometry: to this subject he applied himself at first as a relief from what he considered as a more laborious occupation, and it became at length almost the sole employment of his life.

On the resignation of Dr. Robert Sinclair, Mr. Simson was appointed, in 1711, to succeed him as professor of mathematics in the University of Glasgow. He then applied himself to the duties of his office, and regularly gave lectures on five days in each week during the session of seven months. This practice he continued for nearly fifty years; but in 1758, being then seventy-one

years of age, he was obliged to employ an assistant, and three years afterwards the Rev. Dr. Williamson, who had been one of his pupils, was appointed his successor.

In 1735 Dr. Simson published in 4to. a 'Treatise on Conic Sections,' and a second edition in 1750. In this work the investigations are conducted agreeably to the spirit of the ancient geometry, and propositions are introduced expressly that it might serve as an introduction to the treatise of Apollonius on the same subject.

By the advice, it is said, of Dr. Halley, Simson early directed his attention to a restoration of the works of the Greek geometers, and his first effort was made on the Porisms of Euclid: a branch of the ancient analysis which is only known from the short account in the works of Pappus. In this difficult task however he succeeded, but his tract on the subject was not published till after his death. Having acquired a sort of key to that analysis, he undertook a restoration of the 'Loci Plani' of Apollonius, and this he completed about the year 1738. The work was first published in 1746, and Dr. Simson acquired by it the reputation of being one of the most elegant geometers of the age. Another subject on which the peculiar talents of Dr. Simson were exercised, was the 'Sectio Determinata' of Apollonius, and this also he was so fortunate as to restore. The work appears to have been commenced at an early period of his life, but it was only published, along with the Porisms, after his death.

A perfect edition of the first six, and the eleventh and twelfth books of Euclid's 'Elements' was the next object of Dr. Simson's labours. These were published in a two-fold quarto form, in 1756; in Latin, Glasgow; in English, London. The first octavo edition (called the second) to which the *Data* were added, was published at Glasgow in 1762. Having been very generally used for the purposes of elementary instruction, many editions of this work have since been published.

After his retirement Dr. Simson employed himself chiefly in correcting his mathematical writings. He was seriously ill only during a few weeks previously to his death, which took place October 1, 1768, in the 81st year of his age.

In 1776 Earl Stanhope published, at his own expense, and for private circulation, the abovementioned restorations of Euclid's books of Porisms, and of the two books of Apollonius 'De Sectione Determinata.' Together with these works the same nobleman published a tract on the limits of ratios and another on logarithms, both of which had also been written by Dr. Simson. An edition of the works of Pappus was found among the Doctor's MSS., and was sent by his executors to the University of Oxford.

SIN. In a passage of Scripture, sin is thus defined: 'Sin is the transgression of the law.' (1 John, iii. 4.) Within this definition would be comprehended all actual sins, when the word law is interpreted to mean the Christian law, the rule by which the minds of all who profess Christianity are bound: and not merely open palpable offences against the law, such as murder, theft, lying, and the like, but sinful omissions of duty, and those sins which are only those of contemplation and thought: since the Christian rule commands us not to neglect the performance of our duties, and to keep a watch over the thoughts as well as over the actions and words. It was this comprehensive law which was in the mind of the Apostle when he said that 'sin was transgression of the law,' or at least that other divine law which bound the conscience of the Jews. But the expression may be taken to express more generally any law which a person holds in his conscience to be binding upon him, whether it be a law of nature only, or a law in which the perception of right and wrong is modified by and and mixed with what is received as the will of God concerning us by direct revelation from him.

When the word sin is applied to any act, it is properly used with reference to religious obligation, and to the responsibility in which we stand to God, and the liability to future punishment. 'To do wrong' would express the same as 'to commit sin:' but we use the former phrase without thinking of the offence which is done against God in any act of the kind; not so when we use the other phrase.

Original sin is an expression which is differently interpreted. By some it is considered as being the act of sin committed by our first parents when they transgressed the law which had bound them not to eat of the fruit of a certain tree; and this act of sin *is* regarded as partaken in by all the posterity of Adam, who would thus become liable to punishment, to say nothing of their own sin, but for the great redemption. There are many modifications of this notion till we arrive at the view of original sin which represents the nature of man as changed by the transgression in this particular of our common ancestor; so that a nature previously perfectly innocent became changed into one in which the disposition to sin is inherent, and the repugnance to the Divine will is strong and universal. There are some classes of Christians who do not use the phrase original sin, though they admit the proneness of man to sin, and attribute it to his ignorance and imperfection, to the violence of his appetites and passions, and refer it to that state of probation in which it seems to have been the *intention* of their Maker to place us.

SINA'PIS, the name of a genus of plants belonging to the natural order *Cruciferæ* or *Brassicaceæ*. All the species are known by the name of mustard, a word derived from *mustum ardens*, in allusion to their hot and biting character. They are chiefly natives of the temperate parts of both hemispheres of the Old World. Between 40 and 50 species of this genus are enumerated. Of these two species are well known and much cultivated in this country, *Sinapis nigra* and *S. alba*, the Black Mustard and White Mustard.

S. nigra, the Black Mustard, is found in cultivated fields, waste grounds, and roadsides, throughout Europe. The young plants of both black and white mustard are eaten as salad, and are both cultivated for this purpose. The black however differs from the white mustard in the

flowers and seed being much smaller, and in the latter being black. But the great purpose for which the black mustard is grown is for the seeds, which when ripened and powdered form the well-known condiment mustard.

S. alba, White Mustard, is a native of Britain and most countries in the south of Europe. It is frequently cultivated, and when young is eaten as a salad. Its seeds are white, and by expression yield a bland insipid oil perfectly free from acrimony, but leaving behind a cake more pungent than the seeds themselves.

The chemical constitution of black mustard seems to be of the most complex kind. According to Dr. Pereira, it contains myronate of potash, myrosyne, fixed oil, a pearly fat matter, gummy matter, sugar, colouring matter, sinapisin, free acid, peculiar green matter, and some salts, chiefly sulphate and phosphate of lime.

The fixed oil is perfectly bland, like that of olive or rape, which last it greatly resembles. It exists to the extent of 20 per cent. in white mustard-seed, and about 28 per cent. in black mustard-seed. To obtain it the seeds are crushed in a mill or between rollers, and the skins should be subjected to pressure as well as the farina or flour. The cake may then be sifted and reduced to a fine powder, as it retains all the pungent properties.

SINCLAIR, SIR JOHN, Bart., was born at Thurso Castle, in the county of Caithness, in 1754. He embraced the profession of the law, and was called to the English bar in 1782, having been admitted a member of the faculty of advocates in Scotland in the year 1775. In 1780 he was chosen member for Caithness, and sat in the house during several successive parliaments. He was created a baronet in 1786, and in 1810 was honoured with a seat at the board of privy council. He was likewise a member of several learned societies. He died at Edinburgh, Dec. 21, 1835.

Sir J. Sinclair did much for the improvement of his country. He established a very useful society in Scotland, in 1791, for improving wool, and his exertions led to the formation of the Board of Agriculture, in 1793, of which he was the first president. Among the most important of his numerous works may be mentioned his 'Statistical Account of Scotland;' 'History of the Revenue of Great Britain;' and 'Account of the Northern Districts of Scotland.'

SINDE is that part of Hindustan which extends on both sides of the river Indus from the sea to near the place where the river is joined by the Chenaub, which brings to it the united waters of the five rivers of the Panjab. It lies between 23° 30′ and 29° N. lat., and 67° and 71° E. long. It extends in length S. to N. more than 360 miles, and its average width may be 200 miles. This gives an area of 72,000 square miles.

On the S. and S.W. it borders on the Indian Ocean, and its eastern districts are separated from the province of Cutch by the Runn. E. of it, and chiefly within its boundary, extends the Indian Desert or Thurr, where it borders on Marwar and Jessulmere. On the N.E. are the territories of the Khan of Bhawulpore, and N. those of the Panjab, or Sikhs. The N.W. corner of Sinde reaches the Boogtee Hills, which belong to Afghanistan. On the W. is Beloochistan, from which Sinde is mostly separated by the Hala Mountains.

The sea washes the shores of Sinde for about 150 miles, and is shallow, but the soundings are regular. The tides rise in the mouth of the Indus about 9 feet at full moon; they ebb and flow with great violence, particularly near the sea, where they flood and abandon the banks with incredible velocity. It is dangerous to drop the anchor except at low-water, for the vessel may be left dry a short time afterwards. In the widest mouths of the Indus the tide is not perceptible more than seventy miles from the sea.

The Indus.—Sinde is indebted for its fertility to the inundations of the Indus. [HINDUSTAN, vii. 211.] As far as these inundations extend, the country yields abundant crops; where they cease, and no means of irrigation exist, the country is comparatively a desert. The upper course of the Indus traverses countries which for more than six months are covered with snow, and all its great tributaries, including the five rivers of the Panjab, are in their upper courses surrounded by mountains which rise several thousand feet above the snow-line. As in these parts the difference of the snow-line in summer and winter amounts to 3000 feet, an immense volume of snow is annually dissolved, and the water thus produced raises greatly the level of the river. In many places the waters spread over the adjacent levels and fertilize the soil. Artificial means are also employed to increase these advantages, especially canals and dams. The river begins to rise in April. Early in May the swell of the waters begins to point out the necessity of deepening and cleaning out the various canals. Towards the middle of June there is sufficient water for sowing the crops, which ripen and are cut down in October. At the end of September the waters are confined to the bed of the river.

Surface and Soil.—The Delta, or that part of Sinde which is inclosed by the Sata and Buggaur branches of the Indus, has an alluvial soil. As the great branches of the river are here so numerous, and throw off so many arms, the inundation of this tract is general; and in those places which have not this advantage, artificial channels, about four feet wide and three deep, conduct the waters through the fields. Close upon the sea there is abundance of green forage, which furnishes pasture for large herds of buffaloes. At the back of it extends a belt ten miles in width, where the country is so thickly covered with furze and bushes that it is incapable of being brought under tillage. Agriculture is only carried on in those districts which are more distant from the shores. If we except a few small towns and villages, the inhabitants reside in temporary villages, which they remove according as they are compelled by the increase of the inundation or other circumstances.

That extensive tract of country which lies west of the Indus, and extends from the sea-shore to the town of Sehwun (26° 22′ N. lat.), has a different character. It is only along the banks of

the river that there is a low alluvial tract, a few miles wide, which can be cultivated, as it has the advantage of being irrigated by short cuts from the river. Beyond its limits the country rises higher, and the soil is gravelly, and soon passes into low hills composed of sandstone. Their height seldom exceeds 200 feet; but in approaching the Hala Mountains they rise much higher, and form several short ranges.

On the same side of the Indus, north of the town of Sehwun, is one of the most fertile districts of Sinde, which extends some miles north of Shikarpoor. The country is level, and the means of irrigating the land are abundant; for besides the main channel of the Indus, which is used for irrigating the adjacent lands, the interior of this region, for the greatest part of its extent, is traversed by the Western Narra, which partakes of the inundations of the principal river, and at some places is connected with it by transverse canals. The plain properly extends farther northward to the boundary line of Sinde; but north of Shikarpoor it attains a higher level, and as there are no canals, irrigation is not practised.

The country on the east of the Indus, from the northern boundary-line to the parallel of Hyderabad and Omercote, presents a different aspect. The banks of the river to the distance of two or three miles inland are covered with tamarisk and acacia shrubs, and mostly uninhabited, but frequently cut by canals, which carry the water of the river to the back country. On the edge of this back country the villages are built, and generally raised somewhat above the ordinary level, to avoid the inundations. The soil of this tract is mostly alluvial. The banks of all the canals are fringed with a broad agricultural band, on which numerous large villages are built, many of which contain 500 houses. Besides fertilising the land, these canals afford the means of transporting by boats the produce of the soil. In the fair season, when dry, they become the beaten footpath of the people, and are excellent cart-roads. Beyond the reach of the water of the canals, the country is very little cultivated.

The country south of a line drawn from Hyderabad to Omercote, and included by the Sata and Pooruun branches of the Indus, generally resembles the region just noticed.

A large portion of the Thurr, or Indian Desert, is included within the boundary of Sinde. The Thurr is an extensive sandy tract, destitute of trees, but abounding in grass and jungle. It rises from the plains of Sinde and from the Runn in bold relief, with a demarcation as distinct as if it rose from the sea. Its features are peculiar, and throughout its whole extent preserve a uniform character, being composed of innumerable ridges of loose sand of a bright yellow colour, in height varying from 150 to 600 feet. All rain is absorbed in the light sand of the soil, and no stream or watercourse is observable.

The Runn, which extends between the Thurr and Cutch, is a tract of a very peculiar description, which has no counterpart on the globe. In length it extends from the Koree mouth of the Indus to the north-eastern part of the peninsula of Gujerat, a

distance of about 200 miles; in breadth it is about 35, but there are various belts and ramifications, by the addition of which its area is increased to 7000 square miles. It is a perfectly level tract, on which no fresh water is found, and not even the most stunted vegetable. The soil is a mixture of mud, sand, and clay, and is covered with a thick incrustation of salt in the dry season, and during the south-western monsoon with water. Though somewhat higher than the common level of the sea, it is lower than the adjacent country.

Climate.—The climate of Sinde differs greatly from that of other parts of Hindustan. Though the S.W. monsoons blow so hard along the shores as to prevent vessels approaching them from March to October, they do not bring any periodical rains. Rain is far from being frequent all over Sinde, nor does it occur at certain seasons, though storms may be expected at the end of June or the middle of July. In Upper Sinde (Sirra), that is, north of Hyderabad, the natives of the country divide the year into three seasons, the spring, the hot season, and the cold season. The spring is of very short duration. The cold of the winter continues to the end of February, whilst the heat which commences in the middle of March is so intense, that it is but little exceeded by that of the following months. The hot season may be said to commence in the middle of March, and it continues generally without intermission till the end of August or the middle of September. During the cold season, from October until the end of February, the climate of Upper Sinde is pleasant and salubrious. Frost and ice occasionally occur. The setting in of the cold and violent northern winds of November stops all vegetation except a few stunted tamarisk and babool bushes.

Productions.—Sinde is rich in productions. Though its botanical wealth is not great, the agricultural products are numerous; all the grains and pulse common to India are grown. Rice is the staple in the delta and in the country between the Western Narra and the Indus, but in the other parts wheat and maize are most extensively cultivated. Barley is grown in some districts. Indigo is largely grown in the north-eastern districts, but it is inferior to that of Bengal. Opium is cultivated near Shikarpoor, and in some other districts. The sugar-cane is pretty generally grown throughout the whole of the province, but its produce is inferior to that of Northern Hindustan and the Panjab. Cotton is cultivated everywhere, but the best is grown in the northern districts. Tobacco of good quality is grown in the vicinity of Khyrpoor. Hemp, cucumbers, water-melons, and musk-melons, are extensively cultivated. The gardens produce carrots, turnips, radishes, onions, and several kinds of pumpkins. Among the fruits are the date, mango, pomegranate, apple, grape, lime, citron, fig, and a variety of other fruits.

Dromedaries and asses constitute the principal means of conveyance by land. The horses of Sinde are small but hardy, and capable of enduring great fatigue. Immense herds of buffaloes graze on the banks of the Indus and its arms, and at other places common cattle. Ghee and hides constitute important articles of export. Sheep

and goats are met with almost everywhere in Upper Sinde, and wool is exported from that tract which lies west of the Indus and north of Shikarpoor.

Tigers, wolves, jackals, wild hogs, porcupines, deer, and hares live in the woods. The tiger is only seen north of Bukkur. Hogs are very numerous, and very destructive to the fields. Among the amphibious animals are the alligator, otter, and badger.

Population and Inhabitants.—Sinde is a thinly-peopled country. The whole population is stated not to exceed 1,500,000. The greatest part is a desert, on which only some nomadic tribes wander about with their herds, and the bulk of the population is settled on the banks of the Indus and on the canals which are fed by its waters. The best populated part is that which extends from Sehwun on the south to Bukkur and Shikarpoor on the north.

The population is divided into three distinct classes, the Sindee, the Belooch, and the Hindoo. In all the larger towns Hindoos are most numerous, but in the smaller villages and agricultural districts the Sindees and Beloochees form the bulk of the people.

Divisions and Towns.—Sinde is divided by the natives into two parts: Lar, which comprehends the southern portion as far north as Sehwun; and Sirra, which extends over the northern districts. Lar contains the three seaports of the country, Shah-Bunder, Vikkur, and Kurachee. *Shah-Bunder*, built on the Mull mouth of the Indus, is a small place, accessible for sea boats of 25 tons burden. *Vikkur*, situated on the Hujamree mouth, 25 miles from the sea, is larger, the river being navigable to that place for more than 35 miles for sea boats of 40 tons burden. *Kurachee*, about 30 miles from the most western mouth of the Indus, the Pittee, is built at the head of a creek, distant from the sea 4 miles. A harbour at its entrance, protected by a high headland, affords safe anchorage at all seasons to vessels of 300 tons, from which large boats can pass close up to the town, which is built on a slightly-rising ground and surrounded by a mud wall. The bazaars are extensive, but the streets are narrow and filthy. The inhabitants amount to 14,000, and carry on an extensive trade by sea with India, Arabia, and Persia, and by land with Shikarpoor.

Hyderabad, the present capital and the seat of the government, is built not far from the east bank of the Indus, between this river and the Fulailee branch, on a rocky eminence. It has no remarkable buildings, and the population, amounting to nearly 30,000 individuals, live in mud huts. Nearly half-way between Hyderabad and the Hujamree mouth of the Indus is *Tatta*, the ancient capital, which formerly was washed by the river, but is now five or six miles distant from it. It presents only a heap of mud ruins, and at present contains hardly 8000 inhabitants. At nearly equal distances between Hyderabad and Tatta, on the western banks of the Indus, is the town of *Jurruck*, which is built on a hill 150 feet high, has a good bazaar, and 4000 inhabitants. *Meerpoor* is built on a canal which runs eastward from the Pinyaree branch into the interior, and fertilizes a very large tract of country. This town has mud walls inclosing a circuit of three miles, and contains 10,000 inhabitants. *Omercote* lies on the banks of the eastern Narra, and is built near the edge of the Thurr. It exports the produce of the desert, and contains 2000 inhabitants, chiefly Rajpoots.

Sirra, or Upper Sinde, contains several large places, especially on the west of the Indus. *Sehwun*, a large and formerly an important commercial place, is built on a rocky eminence not far from the place where the Arrul, or Western Narra, river joins the Indus. It contains between 10,000 and 12,000 inhabitants, and carries on an active trade with the fertile country to the north.

The commerce of Sinde is almost entirely concentrated with that of SHIKARPOOR.

On the eastern banks of the Indus stands the town of *Roree*, which is built on a rocky eminence, and contains about 8000 inhabitants. Opposite this place, on an island of the river, is the fortress Bukkur, and on the other side the small town of Sukkur.

Manufactures.—The manufactures of Sinde are not numerous; but they may be considered extensive, when the scantiness of the population is considered. Cotton-cloth of a coarse description is manufactured in the principal towns and villages, chiefly for home consumption, and a little is exported to Afghanistan and Persia. Among the silk manufactures those of Tatta have acquired a repute in India, especially a rich fabric of silk, cotton, and gold, variegated in pattern and of close texture.

History.—Sinde became first known to Europeans by the expedition of Alexander the Great, who followed the course of the Indus to its mouth, and constructed a fleet, which sailed along the coast and up the Persian Gulf to the mouth of the Euphrates. Tatta is considered as the Pattala, and Sehwun the city of Sambus mentioned by Arrian. Nothing is known of the political changes which took place in this part of the world before Mahmud of Ghizni conquered a part of Hindustan, and subjected Sinde to his rule. Since that time up to the last century, Sinde appears always to have been an appendage to that empire, which comprehended the northern parts of Hindustan. But by the peace which Nadir Shah concluded in 1739 with the Mogul emperor, Sinde was dismembered from it and became a part of the Persian monarchy. After the death of Nadir Shah (1747), Ahmed Khan founded the kingdom of Afghanistan, and Sinde was annexed to it, but the government of the country remained in the hands of a Beloochee family, the Kalhoras, who before that period had settled there and acquired great authority. The country afterwards was divided into unequal parts under sovereigns who were called Ameers.

When Shah Soojah had lost the throne of Cabool, these sovereigns considered themselves as quite independent, and in 1834, when he made an attempt to recover the throne of Cabool, they refused him assistance, and opposed the march of his

army through their territories. But he beat them in a battle, and obliged them to pay seven lacs of rupees. Meanwhile Sir Alexander Burnes had visited Sinde (1831) and a treaty of commerce had been concluded between the Ameers and the British government, by which the Indus was to be open to British enterprise. No advantage to British commerce had resulted from this treaty, when the British resolved to replace the dethroned Shah Shoojah on the throne of Cabool. The Ameers, who were still to be considered as dependent on Shah Shoojah, did not oppose the march of the British army through their countries to the Bolan Pass, and surrendered by treaty the fortresses of Bukkur and Kurachee to the British commander. When however the British armies in Afghanistan were nearly destroyed (in 1841), a spirit of insurrection manifested itself in Sinde among the Beloochee tribes, but which subsided when the British army had again advanced into Afghanistan. As the navigability of the Indus for flat-bottomed steam-boats was now ascertained, the British wished to retain the places in Sinde which were still in their possession, and they attempted to establish a free navigation by a new treaty. The Ameers, feeling their inability to resist, were willing to grant the proposed conditions, except one, that is, to permit a trackroad to be made along the banks of the Indus, because such a road would partly destroy their shooting-ground along the river. They had here immense enclosures for the chace of wild animals. It was however soon evident that this was only a pretext for breaking the treaty; the narrow tract along the banks of the river, required for a track-path, would not have sensibly diminished the immense extent of their enclosures. The negociations were scarcely broken off, when an army of 22,000 Beloochees was ready to attack the British, and to expel them from Sinde. Sir Charles Napier, who commanded 3000 men, British and native troops, stationed at Bukkur and its vicinity, immediately put them in motion. He found the army of the Ameers near Meeanee, and on Feb. 17, 1843, an obstinate battle was fought there between the British troops and the Beloochees. After a spirited resistance the Beloochees were completely defeated. They lost 5000 men, with all their artillery and military stores. The Ameers, six in number, came to the British camp and surrendered unconditionally. On the 20th of February their capital, Hyderabad, was taken possession of by the British. The Ameers were removed to Bombay, and received liberal allowances. Thus Sinde became a portion of the British Empire in India.

SINDIA, FAMILY OF. The origin of this celebrated family of Mahratta chiefs and princes is comparatively modern. The family were sudras, of the peaceful tribe of koombe, or cultivators. The first who distinguished himself as a soldier was

Ranojee Sindia, who was originally a potail, or head man of a village. The Peishwa Bajerow, who succeeded his father Biswanath Row in 1720, appointed Ranojee to the humble office of bearer of his slippers. Ranojee was active and enterprising, and he was rapidly promoted. Before he died he had obtained the hereditary government of one-half of the extensive province of Malwa. By his wife, who belonged to his own tribe, he had three sons, Jeypah, Duttagee, and Juttabah; and by a Rajpoot woman he had two sons, Tukajee and Madhajee, of whom

Madhajee Sindia became the head of the family. The date of his birth was probably about 1743.

The battle of Paniput, in 1761, deprived the family of all their possessions in Malwa and Hindustan Proper, and nearly proved fatal to Madhajee Sindia, who received a wound which lamed him for life. By 1764 however, under the Peishwa Mudhoo Row, he had become the most powerful of the Mahratta chiefs, and, with the assistance of his brother, Tukajee Sindia, was not long in regaining all his rights.

On the death of Nujeeb ud Dowlah, the minister of Shah Alim I., in 1771, Madhajee Sindia obtained possession of Delhi, whither he invited Shah Alim to return from Allahabad, where he had been living under the protection of the British since 1755. In December the same year the emperor was crowned with great pomp in his capital. He was not however the less in subjection. Madhajee compelled him to sign a commission by which he appointed the Peishwa vicegerent of the empire; and the Peishwa, by a like commission, appointed Madhajee his deputy.

In 1772, and again in 1773, with his two colleagues, Bassajee Row and Tukajee Holkar, Sindia invaded and ravaged Rohilcund, and was preparing to cross the Ganges, when the murder of the young peishwa, Narrain Row, and the usurpation of the office by his uncle Ragoba, occasioned a war between the British and the Mahrattas. This war, twice interrupted by treaties which were not completed, continued till 1782, when the treaty of Salbhye was concluded, by which Madhajee Sindia was confirmed in all his possessions, the places taken from him by the British were restored, and he was recognised by them as an independent prince.

Madhajee Sindia had now time and opportunity to prosecute his plans of aggrandisement. In 1785 he again appeared at Delhi, and by the murder of two of the imperial ministers once more got the emperor into his power. He also conquered Agra and Alyghur, and obtained possession of nearly the whole of the Doab. About this time he engaged in his service a Frenchman, De Boigne, who became of the most essential service to him; for by his assistance he formed an army consisting of troops regularly disciplined; and added district after district to his possessions, till he became master of nearly all the territory south-west from the banks of the Ganges to the Nerbudda. The battle of Meerta, gained by De Boigne in 1790 over the collected forces of Joudpoor, had made Sindia master of that principality, as well as of the weaker state of Odeypoor. To these conquests was added soon after that of Jypoor, which was followed in 1792 by the defeat of the troops of Junkajee Holkar, when four corps of regular infantry belonging to Holkar's army, which were commanded by a French officer, were almost ut-

terly destroyed. Sindia himself had returned to Poonah in 1791, where he died in 1794.

Madhajee Sindia had no sons. His brother Tukajee had three, of whom the youngest, Anund Row, became the favourite of his uncle, who adopted Dowlut Row Sindia, the son of Anund Row, as his heir.

Dowlut Row Sindia, at the death of his grand-uncle, was only thirteen years of age. He was opposed by the widows of Madhajee, who set up another prince in opposition to him, and he was not established in his power till after several battles had been fought. He married, soon after his accession, the daughter of Sirjee Row Gatkia, an artful and wicked man, who became his minister, to whom is doubtless to be ascribed much of the rapacity and cruelty which marked the early part of Dowlut Row's reign. The seizure and imprisonment of Nana Furnavese, the murder of several Brahmins, the plundering of Poonah and the neighbouring places under pretence of paying the expenses of his marriage, and the aiding of Casee Row Holkar in the murder of his brother Mulhar Row, are among his early atrocities; in addition to which it should be mentioned, that when Sirjee Row Gatkia defeated Jeswunt Row Holkar in 1801, he plundered the city of Indore, set fire to the best houses, and murdered many of the inhabitants. In 1802 however Holkar defeated Sindia, and re-established himself in Malwa. But the interference of the British at length put a stop to this career of spoliation and bloodshed. During the war which followed, the British, in the short period of five months, gained a series of the most brilliant and decisive victories; the battles of Delhi and Laswaree, of Assaye and Arghaum, the reduction of the strong forts of Ahmednugghur, Alyghur, Agra, Gwalior, Aseerghur, and Cuttack, besides a number of inferior conquests. The Mahrattas were now obliged to sue for peace, and by the treaty of Dec. 1803, Sindia was compelled to cede to the British the Upper Doab, Delhi, Agra, Saharunpoor, Meerut, Alyghur, Etawah, Cuttack, Balasore, the fort and territory of Baroach, &c., amounting altogether to more than 50,000 square miles. By a treaty of defensive alliance, Feb. 27, 1804, he engaged to receive a British auxiliary force in those dominions which he was suffered to retain, which were still large, and which were considerably increased, after the subjugation of Holkar, by the territory of Gohud and the strong fort of Gwalior, which were given up to him by the treaty of Muttra, Nov. 23, 1805, one of the conditions of which treaty was, that his father-in-law, Sirjee Row Gatkia, should be for ever excluded from his councils.

Dowlut Row Sindia continued on friendly terms with the British till his death, March 21, 1827. He left an army of about 14,000 infantry, 10,000 cavalry, and 250 pieces of ordnance, with territories worth about 1,250,000*l.* per annum.

Janko Row Sindia, the present Rajah of Gwalior, was elected by the widow of Dowlut Row, Baiza Bai. She was expelled from his territories in 1833 by Janko Row, who is now (1850) about 28 years of age.

SINE and COSINE. [TRIGONOMETRY.]

SINECURE. [BENEFICE, iii., 161.]

SINEW. [TENDON.]

SINGAPORE is a British settlement in the East Indies, situated at the most southern extremity of the Malay Peninsula. It consists of the island of Singapore, and about fifty islets dispersed in the sea south and east of it, in what is called the Straits of Singapore. The territories of this settlement embrace a circumference of about a hundred miles, including the seas and straits within ten miles of the coast of the island of Singapore, and they lie between 1° 8′ and 1° 32′ N. lat., and between 103° 30′ and 104° 10′ E. long.

The island of Singapore occupies about half the space between the two capes with which the Malay Peninsula terminates on the south, Capes Buru and Ramúnia (commonly called Romania). It has an elliptical form, and is about 25 miles in its greatest length from east to west, and 15 in its greatest width. It contains an estimated area of about 275 square miles. It is divided from the continent of Asia by a long and narrow strait called Salat Tabrao, or the old strait of Singapore. This strait is nearly 40 miles long, and varies in width between two miles and a quarter of a mile. At its western extremity, near the island of Marambong, it has only a depth of 2½ fathoms, but farther east it is nowhere less than five fathoms deep. This strait was formerly navigated by vessels bound for the China Seas; but the advantages which the Straits of Singapore offer for a speedy and safe navigation are so great, that the Salat Tabrao has not been used since the Straits of Singapore have become known. The last-mentioned strait extends along the southern coast of the island of Singapore, and the most navigable part lies within the British possessions. It is the high road between the eastern and western portions of maritime Asia.

The surface of the island is gently undulating, here and there rising into low rounded hills of inconsiderable elevation. When the island was first occupied by the British it was entirely, and is still for the greater part, covered with a forest composed of different kinds of trees, five or six of which are well adapted for every object of house-building. The soil of the interior is composed of sand and of clay iron-stone, mixed up with a large portion of vegetable matter, which gives it a very black appearance. There is a general tendency to the formation of swamps. Rivulets are numerous, but they are of inconsiderable size, and the water very bad.

The climate of Singapore is hot, but equable, the seasons varying very little. The atmosphere throughout the year is serene. The smooth expanse of the sea is scarcely ruffled by a wind; but the tides and the rains are more irregular than in most parts of the East. The climate is healthy and favourable to vegetation.

Singapore is not rich in agricultural productions. No part of it was cultivated when the British took possession of the place, and at first the soil was considered ill adapted for agricultural purposes. But considerable tracts near the town

have been cleared by the Chinese, and these industrious people have succeeded in cultivating different kinds of fruits and vegetables, rice, coffee, sugar, cotton, and especially pepper and the betel-vine (*Piper siriboa*). Tropical fruits and vegetables grow well.

The animals of Europe have been introduced, but most of them are few in number, as pasture-grounds are scarce. The Chinese however keep a great number of hogs. None of the large quadrupeds of the continent of Asia, such as elephants, rhinoceroses, tigers, and leopards, are met with on the island, but there are several kinds of monkeys, bats, and other small animals. Birds are numerous; so likewise are tortoises.

In 1819, when the British took possession of the islands, the population amounted to about 150 individuals, mostly fishermen and pirates, who lived in a few miserable huts; about thirty of these were Chinese, the remainder Malays. More than half of the population are settled in the town of Singapore. West of the town only a few settlements occur along the southern shores of the island, and on some of the small islands near the coast. These settlements constitute the district of Singapore town. The country east of the town, which is named the District of Kampong Glam, contains a greater number of settlements, and they extend to the shores of the Salat Tabrao, and the islands of Tekong and Pulo Ubin, which lie within the strait. The population is composed of nearly all the nations of Southern Asia and the Indian Archipelago, among whom a small number of individuals of European origin have settled. The population in 1845 amounted to 57,421, of whom 32,132 were Chinese, and 10,035 Malays. The Europeans and Chinese constitute the wealthier classes. The Europeans are for the most part merchants, shopkeepers, and agents for mercantile houses in Europe. Most of the artisans, labourers, agriculturists, and shopkeepers are Chinese. The Malays are chiefly occupied in fishing, collecting sea-weed, and cutting timber, and many of them are employed as boatmen and sailors.

The town of Singapore stands on the southern shores of the island, in 1° 17′ 22″ N. lat., and 103° 51′ 45″ E. long., on a level and low plain of inconsiderable width, fronting the harbour. It extends from two to three miles along the shore, but only a thousand yards inland, where it is enclosed by hills from 100 to 150 feet high. The commercial portion of the town occupies the most western extremity, and is separated from the other parts by a salt creek, called the Singapore River, which is navigable for small craft. A good wooden bridge connects it with the eastern part, which contains the dwellings of the Europeans, the public offices, and the military cantonments. Contiguous to this portion of the town is the government-house, which is built on a hill. The most eastern part is occupied by the sultan of Johore, the Malays, and Bugis. The whole of the warehouses, and all the dwelling-houses in the principal streets in their vicinity, are built of brick and lime, and roofed with red tiles. The more distant dwelling-houses are built of wood, but roofed with tiles. It is only on the distant outskirts of the town that there are huts with thatched roofs. Ships lie in the roads of Singapore at the distance of from one to two miles from the town, according to their draught. With the assistance of lighters, cargoes are discharged and taken in with scarcely any interruption throughout the year. The lighters convey the goods to the River of Singapore, where they discharge them at a convenient quay, and at the doors of the principal warehouses. The principal public buildings at Singapore are the government-house, a court-house, a gaol, custom-house, Mission chapel, and the Singapore Institution. There are several native schools in the town.

If the commerce of Singapore were limited to the produce of the place, it would hardly give employment to more than two or three vessels. But Singapore has become the London of southern Asia in the Indian Archipelago. All the nations that inhabit the countries bordering on the Indian Ocean resort to it with the produce of their agriculture and manufacturing industry, and take in exchange such goods as are not grown or produced in their own countries. All of them find there a ready market, which at the same time is well stocked with European goods. This effect has partly been produced by the wise policy of declaring the harbour of Singapore a free port, in which no export or import duties, nor any anchorage, harbour, nor lighthouse fees, are levied.

The commerce of Singapore may be divided into the eastern trade, that of the Straits, and the western trade. The eastern trade, or that which is carried on with the countries east and south-east of Singapore, comprehends the commerce with China, the Spanish settlement of Manilla, the independent tribes of the Indian Archipelago, the Dutch settlements on the island of Java and at Rhio, the new settlements at Sarawak and Labuan, the Australian and New Zealand colonies, and the countries of the Peninsula beyond the Ganges which lie east of the Malay Peninsula. The most important branches of this commerce are those with China, Java, and Siam.

The commerce of the Straits is carried on with the Malay Peninsula and with the island of Sumatra. The harbours on the eastern side of the peninsula, which trade with Singapore, are Pahang, Tringanu, and Calantan, and this trade is rather active. The trade with the western coast of the peninsula is not important, and is almost entirely limited to the harbour of Salangore. The commerce between Singapore and the island of Sumatra is almost entirely limited to the ports along the eastern coast of the island. There is hardly any commercial intercourse with the Dutch settlements of Bencoolen, Padang, and Trappanuli, which are on the western coast. The commerce of the eastern coast is divided between Singapore and Penang.

The western trade of Singapore comprehends that with Calcutta, Madras, Bombay, the island of Ceylon, and Arabia, with the Cape of Good Hope, Mauritius, and Australia, and with Europe and America. To enumerate the articles which constitute the materials of these three great streams

of commerce would be to name almost all that Europe sells to Asia or Asia to Europe; or which are interchanged among the nations of eastern Asia.

It is estimated that 300,000 tons of shipping now enter Singapore annually. The imports in 1843 were valued at 12,435,250 Spanish dollars; the exports at 10,783,324 dollars. Since that year the commerce has largely increased.

On the site of the present British settlement formerly stood the capital of a Malay kingdom, of which Raffles was able in 1819 to trace the outer boundary. This town was taken in 1252 by a king of Java, and the residence of the king was transferred to the town of Malacca, which was then founded. After that event the town seems gradually to have decayed, and the country to have been abandoned; for when the British, after having restored the town of Malacca to the Dutch in 1816, wished to form a settlement on the shores of the Strait of Malacca or its neighbourhood, that they might not be entirely excluded from the commerce of the Indian Archipelago by the Dutch, they found on their arrival at Singapore that the population of the whole island did not exceed 150 individuals. In 1824 the British obtained the sovereignty and fee-simple of the island, as well as of all the seas, straits, and islands, for the sum of 60,000 Spanish dollars, and an annuity of 24,000 Spanish dollars for the natural lives of the proprietors. In 1826 Singapore was placed under the provincial government of the Straits Settlement, which is fixed on the island of Penang.

SINGLETON, HENRY, was born in London, 1766. He was brought up by an uncle, William Singleton, a miniature-painter, who gave him instruction. At the age of eighteen he obtained the first silver medal for drawing in the Royal Academy; and in 1788 he obtained the gold medal for the best historical painting: the subject was Dryden's 'Ode on Alexander's Feast.' The first remarkable picture which he produced was a large portrait piece of all the Academicians assembled in the Council Chamber; this picture was painted in 1793.

Singleton died in 1839. He was versatile and ready in invention, though his style of drawing was uniform; and both his pictures and his designs are very numerous. He was much employed by publishers.

SINIGAGLIA. [PESARO-ET-URBINO.]

SIPHNO, called also *Siphanto* and *Sifanno*, an island in the Mediterranean, forming one of the group called the Cyclades. [ARCHIPELAGO, GRECIAN.] The original name was Mérope. It was colonised by Ionians from Athens. (Herodot., viii., 48.) In the reign of Polycrates, the tyrant of Samos, about 520 B.C., the inhabitants were very flourishing in consequence of their gold and silver mines, and, according to Herodotus (iii., 57), they were the most wealthy of the islanders. Their mines were afterwards less valuable, and they seem ultimately to have been wrought out.

Siphno is between 36° 50′ and 37° 10′ N. lat., and in 25° 10′ E. long.: it is situated to the S.E. of Serpho, N.E. of Milo, and S.W. of Paro, lying immediately opposite Antiparo. It is of an oblong form, and about 30 miles in circumference. Fiedler ('Reise durch Griechenland,' 1841) mentions only two towns: Kastron, on a strong and rocky hill overlooking the sea, which is the residence of the governor; and Stawri, in the centre of the island. The population of Siphno in the time of Tournefort was about 5000. The lands are chiefly laid out in vineyards; but the wine is not so good as that of the neighbouring islands.

SIPHON (*σίφων*), a bent tube whose arms are of unequal length. The shorter of these arms being immersed in a liquid which is to be drawn from a vessel or a reservoir, and the air being removed by suction, or by means of a syringe, the liquid immediately rises in the immersed arm in consequence of the pressure of the atmosphere on that which surrounds the tube; it then passes over the bend and flows through the open orifice at the lower extremity of the other arm. The length of the column of fluid in this arm being greater than in the other, its superior weight causes the flow to be continuous. This machine was probably invented in the second century B.C., by Hero of Alexandria, who, in the 'Spiritalia,' or Pneumatics, mentions its employment for the purpose of conveying water from one valley to another over the intervening ground.

The phenomena presented by springs of water are explained by supposing that the rain which is absorbed in the earth occasionally finds its way by small channels to some interior cavity, and from thence by other channels, which may be considered as natural siphons, to an orifice on a lower level at the surface of the ground. At this orifice it issues in a stream of water, which continues to flow till the surface of the water in the cavity has descended below the tops of the vertical bends in the channels.

SIPHON-BAROMETER. [BAROMETER.]

SIPHONIA, a genus of plants of the natural family of *Euphorbiaceæ*, consisting of two species, but one may be only a variety of the other. This is celebrated as being the tree which yields the large quantities of Caoutchouc, called *Cahuchu* by the native Americans, annually imported from Para in South America. *Siphonia elastica* is a tree fifty to sixty feet in height, common in the forests of Guiana and Brazil, and which has been introduced into the West Indies. Caoutchouc is the milky juice of the plant which exudes on incisions being made, and solidifies on exposure to the air.

SIPHONOBRANCHIA'TA, M. De Blainville's name for the first order of his first subclass of Mollusks, *Paracephalophora dioica*. He describes the Siphonobranchiata as possessing organs of respiration constantly formed of one or two pectiniform branchiæ, situated obliquely on the anterior part of the back, and continued in a cavity, the superior wall of which is provided with a tubiform canal more or less elongated and attached to the columella, and arranges under the order the following families:—SIPHONOSTOMATA; ENTOMOSTOMATA; and *Angyostomata*.

SIPHO'NOPS, Wagler's name for a genus of Cæcilioïdians.

The first suborder of the Batrachians, the

Péromèles of MM. Duméril and Bibron, consists but of one family, the *Ophiosomes* (Snake-Bodied Batrachians) or *Cæcilioïdians*. Their round elongated form, without either tail or feet, approximates so closely to that of the serpents, that the greater number of authors have arranged them in the order Ophidians, acknowledging at the same time the anomalies which they present, and observing that they ought to form a very distinct group. [SERPENTS.]

The characters which lead to the classification of these reptiles into one family, and to their separation from all others, are, 1st, a body extremely extended in length, and of a cylindrical shape; 2nd, the absence of limbs or lateral appendages proper for locomotion; 3rd, a skin naked in appearance and viscous, but concealing between the circular folds which it forms many rows or rings of flat, delicate, imbricated scales, with free and rounded borders, resembling those of the greater part of the fishes; 4th, the rounded orifice of their cloaca situated below, very near the posterior extremity of the body, which is sometimes truncated, as it were, and rounded; sometimes obtusely pointed, as in the genus *Typhlops;* 5th, their head, as in all the Batrachians, is articulated to the spine by means of two distinct and separate condyles; 6th, their lower jaw moves upon the cranium without any separate articular bone, and the two branches which form it are short and very solidly soldered together towards the symphysis of the chin.

For structural and dental peculiarities minutely detailed we refer to Professor Owen's 'Odontography.'

The genus *Cæcilia* contains four species, one Asiatic, one African, and two American.

The genus *Siphonops* contains two known species, both American.

The genus *Epicrium* contains only one known species, found in Java and Ceylon.

The genus *Rhinatrema* contains only one species, from Cayenne.

M. Leperieur, during his stay at Cayenne, having procured a living *Cæcilia*, which he placed in a vessel filled with water, he saw it bring forth, in the space of some days, from five to seven young, perfectly similar to their mother. Upon this MM. Duméril and Bibron observe that the *Cæciliæ*, in spite of their bearing a greater resemblance to the Batrachians than to the other reptiles, must be ovoviviparous. The fecundation of their germs must be effected in the interior of their body; and their metamorphoses must take place in the body of their mother, as in the case of the Black Salamander of the Alps. [CECILIANS.]

SIPHONOSTO'MATA, M. de Blainville's name for his first family of SIPHONOBRANCHIATA.

The forms comprised under this family are principally to be found under the extensive genus *Murex* of Linnæus. All the known animals belonging to it are carnivorous and marine, and all are furnished with a horny operculum. The *Siphonostomata* are thus subdivided by M. de Blainville:—

1. No persistent *Bourrelet* on the right lip.

Genera—*Pleurotoma, Rostellaria, Fusus, Pyrula, Fasciolaria, Turbinella.*

2. A persistent *Bourrelet* on the right lip.

Genera—*Columbella, Triton, Lotorium, Struthiolaria, Ranella, Murex.*

The *Entomostomata* and *Siphonostomata* may be considered as the two great tribes of carnivorous gastropods or trachelipods appointed to keep down the undue increase of the *Conchifera* and herbivorous gastropods, whose shells the majority of those carnivorous testaceans penetrate by means of an organ which makes a hole as truly round as if it had been cut by an auger, and then feed on the juices of the included animal.

Dr. Buckland notices this habit with a view to the condition of the testaceous inhabitants of the earlier seas of our planet with his wonted felicity. 'Most collectors,' says the Professor, 'have seen upon the sea-shore numbers of dead shells, in which small circular holes have been bored by the predaceous tribes, for the purpose of feeding upon the bodies of the animals contained within them: similar holes occur in many fossil shells of the tertiary strata, wherein the shells of carnivorous trachelipods also abound; but perforations of this kind are extremely rare in the fossil shells of any older formation. In the green-sand and oolite they have been noticed only in those few cases where they are accompanied by the shells of equally rare carnivorous mollusks; and in the lias and strata below it, there are neither perforations, nor any shells having the notched mouth peculiar to perforating carnivorous species. It should seem from these facts that, in the economy of submarine life, the great family of carnivorous trachelipods performed the same necessary office during the tertiary period which is allotted to them in the present ocean. We have further evidence to show that in times anterior to and during the deposition of the chalk, the same important functions were consigned to other carnivorous mollusks, viz. the testaceous cephalopods: these are of comparatively rare occurrence in the tertiary strata and in our modern seas; but throughout the secondary and transition formations, where carnivorous trachelipods are either wholly wanting or extremely scarce, we find abundant remains of carnivorous cephalopods, consisting of the chambered shells of *nautili* and *ammonites*, and many kindred extinct genera of polythalamous shells of extraordinary beauty. The molluscous inhabitants of all these chambered shells probably possessed the voracious habits of the modern cuttle-fish; and by feeding like them upon young *testacea* and *crustacea*, restricted the excessive increase of animal life at the bottom of the more ancient seas. Their sudden and nearly total disappearance at the commencement of the tertiary era would have caused a blank in the "police of nature," allowing the herbivorous tribes to increase to an excess that would ultimately have been destructive of marine vegetation, as well as of themselves, had they not been replaced by a different order of carnivorous creatures, destined to perform in another manner the office which the inhabitants of the ammonites and various extinct genera of chambered shells

then ceased to discharge. From that time onwards we have evidence of the abundance of carnivorous trachelipods, and we see good reason to adopt the conclusion of Mr. Dillwyn, that in the formation above the chalk the vast and sudden decrease of one predaceous tribe has been provided for by the creation of many new genera and species possessed of similar appetencies, and yet formed for obtaining their prey by habits entirely different from those of the cephalopods. The design of the Creator seems at all times to have been to fill the waters of the seas and cover the surface of the earth with the greatest possible amount of organized beings enjoying life; and the same expedient of adapting the vegetable kingdom to become the basis of the life of animals, and of multiplying largely the amount of animal existence by the addition of *carnivora* to the *herbivora*, appears to have prevailed from the first commencement of organic life to the present hour.' ('Bridgewater Treatise.')

SIREN (Zoology), a genus of Perennibranchiate Batrachians.

Generic Character.—Form elongated, nearly like that of the Eels; branchial tufts three on each side; no posterior feet, nor any vestige of a pelvis; head depressed; gape of the mouth not wide; muzzle obtuse; eye very small; the ear concealed; lower jaw armed with a horny sheath and several rows of small teeth; the upper jaw toothless; but numerous small, pointed, retroverted teeth occur on the palatial region. [SALAMANDRIDÆ.]

Dr. Garden appears to be the first who called attention to this form, which is declared by Cuvier to be one of the most remarkable of the class of Reptiles, and indeed of the whole animal kingdom, from the anomalies of its organisation, and its apparent relationship with different families, and even classes. Dr. Garden (1765–1766) sent a description of this reptile to Linnæus and Ellis, and the former, relying upon Dr. Garden's assurance that the Siren did not change its form, established an additional order for it in his class *Amphibia*, with the name of *Meantes*.

Pallas, Hermann, Schneider, and Lacépède however saw, as Cuvier remarks, nothing more in the Siren than the larva of some large unknown Salamander; whilst Camper, followed by Gmelin, went so far as to give it a place among the fishes. The latter arranges it at the end of the Eels, under the name of *Muræna Siren*. These differences of opinion sufficiently show the doubts which arose on the examination of this extraordinary form.

Cuvier, in 1807, satisfactorily established, in a memoir read to the Institute of France, and inserted in the 1st vol. of the 'Zoological Observations of Humboldt,' that whatever changes it might undergo, the Siren was a reptile *sui generis*, which never could have hind feet, and whose whole bony framework differed essentially from that of the Salamanders; that there was no probability that it ever changed its form or lost its branchiæ; and that the Siren is consequently a true amphibian, which respires at will throughout its life, either in the water by means of branchiæ, or in the air by means of lungs. This conclusion rested upon that solid basis which has given such value to the views of this great zoologist—his personal observations made on the osteology and splanchnology of the animal.

Dr. Garden had, in his correspondence with Linnæus and Ellis, come to the same conclusion from other evidence. Dr. Garden had observed the animal from the length of four inches to that of three feet and a half; he had satisfied himself that in the whole province there was not, with the exception of the alligator, any Saurian or Salamander which exceeded six or seven inches in length, and he had convinced himself that it was oviparous, and that it propagated without losing its branchiæ.

For an account of the osteological anatomy of the Siren, see Cuvier's 'Ossemens Fossiles;' and, for other anatomical details, John Hunter's paper in the 'Phil. Trans.,' lvi., 1766, may be consulted. See also 'Catalogue,' vol. ii., in Museum, Royal College of Surgeons.

Two species are known.

Siren lacertina grows to the length of three feet; its colour is blackish. The feet have four toes, and the tail is compressed into an obtuse fin.

This Siren inhabits the marshy grounds of the Carolinas, especially those where rice is cultivated. It lives in the mud, from which it makes excursions, sometimes on land and sometimes in the water. From the swampy places by the sides of pools and under the overhanging trunks of old trees where it is found, it was called by the inhabitants 'the Mud Iguana.' Garden was of opinion that it feeds on serpents, and that it uttered a cry similar to that of a young duck; but Barton contests these statements. Its food is generally believed to consist of earth-worms, insects, &c. In 1841 a fine lively specimen existed in the garden of the Zoological Society in the Regent's Park. It was kept in a vessel of pond-water with a deep bottom of mud, in which it hid itself. It was twenty inches long, as large as the wrist of a stout child of six months old, and very eel-like in its movements and appearance. About a dozen and a half of earth-worms were supplied to it as food every other day.

Siren striata is blackish, with two longitudinal yellow stripes on each side; has only three toes on each foot, and is about nine inches in length.

SIRENS are described in the 'Odyssey' as two maidens who sat by the sea, and so charmed with their music all who sailed by, that they remained on the spot till they died. Ulysses, by the direction of Circe, had himself tied to the mast, and stopped the ears of his companions with wax, by which means he was able to hear their music, and escape from its influence. ('Odyssey,' xii. 39, &c., 169.)

SIRHIND, a district of northern Hindustan, which extends from 29° 27′ to 31° N. lat., and from 73° 38′ to 77° 38′ E. long. The northern boundary is formed by the Sutlege, and the Jumna forms a part of the eastern boundary. The principal river is the Gagur. Most of the other rivers are affluents of the Gagur. Sirhind constitutes a portion of what are called the Hill States, and is

inhabited by the Sikhs. The town of Sirhind, from which the district derives its name, though formerly a place of importance, is now little else than a heap of ruins.

SIRI, VITTO'RIO, born at Parma in 1625, became a priest, and afterwards went to Paris, where Louis XIV. appointed him his almoner and historiographer. Siri wrote a journal in Italian, entitled 'Mercurio Politico,' which he continued for many years. He also wrote another journal, entitled 'Memorie Recondite,' which fills eight volumes. Le Clerc ('Bibliothèque Choisie') observes that both these works contain a vast number of valuable authentic documents. Siri died at Paris, in 1685.

SIRI'CIUS, a native of Rome, succeeded Damasus I. as bishop of that city, A.D. 384, under the reign of Valentinian II. [POPE.]

SIRINAGUR. [CASHMERE.]

SI'RIUS and PRO'CYON, the Greek names of the bright stars in the constellations of the Great and Little Dog. These are Orion's dogs, according to some, and those of minor personages, according to others. The whole of their mythic explanations form a proof that the constellations are not Greek in their origin. In a passage of Hesiod he has been supposed to speak of the sun under the name of Sirius; and Hesychius defines the word to mean both the sun and the dog-star. The Egyptians called the dog-star Sothis, and from its heliacal rising had warning that the overflow of the Nile was about to commence. Now the overflow of the Nile follows the summer solstice; whereas, by the precession of the equinoxes, the heliacal rising of Sirius is now about the tenth of August. This heliacal rising is a very indefinite phenomenon, and will serve any system: by it Bailly, from Bainbridge's calculations, was able to carry back the settlement of Egypt 2800 years before Christ: while Newton, by a reckoning made on the same principles, made many ancient events seem later than was generally supposed.

The greatest heats of summer generally follow the summer solstice, and in the Mediterranean latitudes, and in ancient times, it was observed that the unhealthy and oppressive period coincided with the heliacal rising of the dog-star. We say the Dog-Star without specifying whether it was Sirius or Procyon; it is uncertain which it was, and may have been both, for the heliacal risings do not differ by many days. The star itself was in Latin *canicula*, which should seem to apply to the lesser dog, and Horace says—

> 'Jam *Procyon* furit
> Et stella vesani Leonis [sc. Regulus]
> Sole dies referente siccos.'

All antiquity attributed an evil influence to the star; and though Geminus among the ancients, and Petavius among the moderns, thought that the effects were to be attributed to the sun alone, they had hardly any followers until the fall of judicial astrology. Even at this day, when the heats of the latter part of the summer are excessive, we are gravely told that we are in the Dog-Days; and the almanacs, in which an absurdity has the lives of a cat, persist in informing us that the Dog-Days begin on the 3rd of July, and end on the 11th of August. Now, as the heliacal rising of Sirius takes place about the very end of this period, it is clear that the cart has got before the horse, or the mischief before the dog. Moreover it is notorious that in our island the oppressive heats of the summer, during which dogs are apt to run mad (which is what many people think the name arises from, as indeed it was anciently recorded among the effects of the star), generally fall about the middle or end of August. The real classical Dog-Days are the twenty days preceding and the twenty days following the heliacal rising of whichever star it was, Sirius or Procyon. It is perfectly useless to retain this period. Surely these dogs have had their day.

SIRMOND, JACQUES, was born at Riom, in France, Oct. 22, 1559. He was educated at the Jesuits' College at Billom. When he had finished his noviciate, he went to Paris as professor of rhetoric, in which city he remained till 1790, when he repaired to Rome, on the invitation of the Père Aquaviva, general of the society of Jesuits, who chose Sirmond as his secretary. In this employment he continued sixteen years. In 1608 the Père Sirmond returned to Paris, and soon afterwards commenced a visitation of the libraries and archives of the convents, and was thereby enabled to save from destruction a great number of valuable documents. Sirmond's first publication was the 'Opuscules' of Geoffroi, abbé de Vendôme, in 1610; from which time he continued to add to his reputation by other publications almost every year. Louis XIII., in 1637, made him his confessor. Having left the court on the death of Louis XIII. in 1643, Sirmond recommenced his literary labours, and continued to occupy himself in the same way till his death, Oct. 7, 1651.

Sirmond's 'Ouvrages' were collected and published in 1696, in 5 vols. folio. They are nearly all on theological and ecclesiastical subjects.

SIROCCO is the name given to a hot and suffocating wind which appears to originate with the rarefied air in the sandy deserts of Arabia, about the season that the overflowing of the Nile commences; it extends eastward over Arabia, Persia, and some parts of Hindustan, and it is felt, but with less inconveniences, in Italy and Spain.

SISINIUS. [POPE.]

SISKIN. [ABERDEVINE.]

SISMONDI, JEAN CHARLES LEONARD SIMONDE DE, was born at Genoa, May 9, 1773. He was the son of a Protestant minister of the canton of Geneva. He was first placed at the College of Geneva, where he acquired a sound knowledge of classical literature, and thence removed to the Auditoire, where he was enabled to pursue a more extended course of study. His education being completed, he was compelled by change of fortune to enter as a clerk in the counting-house of the firm of Eynard and Co. at Lyon. The revolutionary troubles, which overtook Lyon in 1792, compelled Sismondi to return to Geneva: this city however proved no asylum from political persecution; his father and himself were imprisoned; but, as no charge could be

brought against them, they were soon after liberated. In Feb. 1793, he accompanied his family to England, where they intended to settle; but the dilapidated state of his father's fortune rendered their residence in London one of privations to which they had not been accustomed, and, after a year's residence in different parts of England, they returned to Geneva. They next removed to Châtelaine, and in 1795 to Florence, where they purchased a small farm at Valchiusa, near Pescia. Here Sismondi divided his time between the active superintendence of his farm and the preparation of a work which he had projected during his travels, 'Recherches sur les Constitutions des Peuples Libres.' These researches, though they have not been published, are generally regarded as the groundwork of his subsequent historical writings.

In 1801 appeared at Geneva the first published work of Sismondi, 'Tableau de l'Agriculture Toscane.' The year previous to the publication of this work he and his parents had again returned to Geneva. He published, in 1803, his essay on political economy, with the title 'De la Richesse Commerciale, ou Principes d'Économie Politique appliquée à la Législation du Commerce.' This work he afterwards entirely remodelled, and, in 1819, published it under the title of 'Nouveaux Principes d'Économie Politique.' The views of Adam Smith are almost implicitly followed in this treatise. At the suggestion of his mother, he was induced, in 1805, to accompany Madame De Stael in a tour through Italy. Two volumes of his 'Républiques Italiennes' were published at Zürich, 1807, and the last appeared in 1818. While engaged in writing this history he was likewise employed as a contributor to the 'Biographie Universelle,' which was publishing in Paris under the editorship of Michaud. In 1811 he delivered at Geneva a course of lectures upon the 'Literature of the South of Europe,' which were printed at Paris in 1813. In 1813 Sismondi visited Paris, which at that time presented an interesting study for a political observer. During the Hundred Days a series of letters, which he published in the 'Moniteur,' on the French Constitution, attracted the attention of Napoleon, who requested an interview with the author. The interesting details of this interview were immediately after reported by Sismondi to his mother, and an abridgment of them may be seen in an article of the 'Quarterly Review,' vol. 72, pp. 318-321.

In 1819 Sismondi began his longest, and, as it is by some considered, his best work, 'L'Histoire des Français,' which occupied him till the close of his life. In 1830 he published, in 'Lardner's Cabinet Cyclopædia,' an abridgment, in English, of his 'Républiques Italiennes;' a French edition of this work appeared in Paris in 1832, under the title 'Histoire de la Renaissance de la Liberté en Italie.' The last of his historical works is entitled 'Histoire de la Chute de l'Empire Romain et du Déclin de la Civilisation.' This work, which was published at Paris in 1835, embraces the history of 750 years, from A.D. 250 to 1000. The other writings of Sismondi are — 'Julie Sevère,' an historical novel, Paris, 1822; 'Études sur les Sciences Sociales,' Paris, 1836; 'De la Vie et des Ecrits de Th. Mallet,' 1807, 8vo. He died June 25, 1842, as he was occupied in correcting the last proof-sheets of his 'Histoire des Français.'

SISON, the name of a genus of plants belonging to the natural order *Umbelliferæ*. Several species were formerly referred to this genus which are now placed under various genera. The only species that is now decidedly referred to Sison is the *S. amomum*, Hedge Bastard Parsley. It is a native of France, Sicily, Italy, Greece, and Great Britain.

SISSOO, a tree well known throughout the Bengal Presidency, and highly valued on account of its timber. It is common chiefly in the forests and beds of rivers which extend all along the foot of the Himalayas up to 30° N. lat. The trunk is generally more or less crooked, lofty, and often from three to four feet in diameter. It yields the Bengal shipbuilders their crooked timbers and knees. Dr. Roxburgh describes it as being tolerably light, remarkably strong, but not so durable as could be wished; the colour is light grayish-brown, with dark veins: he says that upon the whole he scarcely knows any other tree more deserving of attention, from its rapid growth in almost every soil, its beauty, and uses. The Sissoo belongs to a genus *Dalbergia*, which abounds in valuable timber trees, as *D. latifolia*, which is usually called Blackwood-Tree by the English, and of which the wood is exported as a kind of ebony, sometimes also called Black Rose-Wood.

SISTERON. [ALPES, BASSES.]

SISTRUM, a musical instrument of percussion, of the highest antiquity, constructed of brass, and shaped like the frame and handle of a racket, the head part of which had either three or four horizontal bars placed loosely on it, which were tuned, most probably, by some scale, and allowed to play freely, so that when the instrument was shaken, piercing ringing sounds must have been produced.

SISYMBRIUM, the name of a genus of plants belonging to the natural order *Cruciferæ*. *S. officinarum*, Common Hedge-Mustard, is a native of Europe, and grows in waste places and waysides, among rubbish, and along the sides of walls. It is plentiful in Britain, and also the north of Africa. The whole plant is warm and acrid, and is often cultivated for use as a pot-herb. *S. Irio*, London Rocket, or Broad-Leaved Hedge-Mustard, is a native of waste places throughout Europe, but especially about London. It is said to have entirely covered the ground in the following spring of the great fire of London in 1666. *S. Sophia*, Five-Leaved Hedge-Mustard, or Flixweed, grows on dry banks, waste-ground, dunghills, and among rubbish in most parts of Europe. It is frequent in Great Britain. *S. millefolium*, Millfoil-Leaved Flixweed, native of Teneriffe, on the rocks in the lower parts of the island. It is a greenhouse species.

This genus at one time included that now known under the name of *Nasturtium*. The

latter was originally separated by Brown. A well-known species is the *Nasturtium officinale*, formerly *Sisymbrium Nasturtium*, the Common Water-Cress. This plant is a native of rivulets, and is very plentiful in Great Britain. It has a warm agreeable flavour, and has long been one of the most popular plants as a salad. The Water-Cress is cultivated to a very great extent in the neighbourhood of London. The plants are placed out in rows in the bed of a clear stream, in the direction of the current; and all that is required for their successful growth is replanting occasionally and keeping the plants clear of mud and weeds: sandy and gravelly bottoms are best.

SITKHA is the name of the most important of the Russian settlements on the west coast of North America, though its proper name is New Arkhanghelsk. This place lies in 57° 2′ 50″ N. lat., and 135° 18′ W. long., and is built on one of the group of islands which received from Vancouver the name of King George III.'s Archipelago. The harbour, which Vancouver named Norfolk Sound, but which is now better known as the Bay of Sitkha, is spacious and safe, and offers excellent anchorage opposite the settlement. The place itself is surrounded by a wooden wall, and enclosed by mountains of considerable elevation, which are almost covered with forests, in which excellent timber is found. Ship-building constitutes the most important of the branches of industry, and all the vessels of the Russian American Company are now built at this place, since ship-building has been discontinued at Okhotsk. New Arkhanghelsk is the centre of the administration of the Russian territories in America, over which the American Company exercises sovereign powers, nearly in the same way as the Hudson's Bay Company over a much more extensive portion of North America. The collecting of furs is the principal object of both companies, and New Arkhanghelsk may be compared with Fort York, which lies nearly under the same latitude on the eastern coast of America. Sitkha is milder, but more humid, than the east coast of America in the same latitude.

When Sir George Simpson visited Sitkha, he found the inhabitants to amount to about 1200, 500 of whom were men engaged in the Company's service. The governor's residence is a large building; but the other houses of the place are little better than 'wooden hovels, huddled together without order or design.' The yearly sale of skins and furs at this place is stated by Sir G. Simpson to be as follows:—Seal-skins, 10,000; sea-otter-skins, 1000; land-otter-skins, 2500; beaver-skins, 12,000; fox, marten, and some others, quantity not stated; and sea-horse teeth, 20,000.

SITTA. [NUTHATCH.]

SITTINGBOURNE. [KENT.]

SIUM, the name of a genus of plants belonging to the natural order *Umbelliferæ*. *S. Sisarum*, Skirret, is the best-known plant of this genus. The French call it *Chervis*, the Germans *Zucker-Wurzel*, and in the north of Scotland, where it is much eaten when cooked, it is called *Crummock*. When eaten the tubers are boiled and served up with butter, forming, according to an old writer, 'the sweetest, whitest, and most pleasant of roots.' The Skirret is a native of China, and is reputed in that country to possess peculiar medicinal virtues. *S. nodiflorum*, Fool's Water-Cress, or Procumbent Water-Parsnip, is a native of Europe, in ditches and rivulets, and is common in Great Britain. A small and large variety are recorded, the one not attaining more than three or four inches in height, the other as many feet. It was formerly admitted into the 'London Pharmacopœia,' on account of its efficacy in cutaneous diseases and scrofula.

SIVA, the personification of the destroying principle, forms, with the two other gods, Brahma and Vishnu, the Trimûrti, or triad, of the Hindoos; and although, in allusion to his office as destroyer, he is classed third, yet he is generally allowed to occupy the second place among the Hindoo deities, or even (according to Kindersley) the first, as his supremacy appears to have obtained more general assent than that of Vishnu. Indeed the worship of Siva is so predominant, that Brahma, who is the only one of the three mentioned by Manu, and who seems to have enjoyed a larger share of adoration in ancient times, has now only one temple in India, while Mahâdeva (a name of Siva) and the adventurous Vishnu, whose incarnations attract so much of the veneration of the Hindoos, are, in fact, the only gods of the whole Hindoo pantheon who have numerous worshippers. This however is no proof that Siva or Vishnu dates from a later period. The personification of the three divine attributes originates with the Vedas, and the names of the three gods are mentioned, though rarely, and without the least allusion to their pre-eminence over the elemental gods or over each other; but we do not find that the two great sects of India, the Vaishnavas (followers of Vishnu) and the Saivas (worshippers of Siva) came into existence before the seventh or eighth century of our æra. It is therefore to the Purânas (the scriptures of the modern Hindoo religion) that we must ascribe the extension of the worship of Siva and the character which now distinguishes this god. The present popular form of Siva-worship in all probability had not assumed its actual state before the great Saiva reformer, Sankara Acharya, who lived in the eighth or ninth century. ('Vishnu Purâna,' Pref., p. x.) This opinion is supported by the well-founded assertion that the Saiva faith was instituted by Paramata Kalânala, who is described in the 'Sankara Vijaya' of Ananda Giri as teaching at Benares, and assuming the insignia that characterise the Dandis, a sect of Saivas of modern times. ('Asiat. Res.,' xvi. 22.) No allusion is made in the Purânas to the original power of this god as a destroyer; that power not being called into exercise till after the expiration of twelve millions of years, when, according to Puranic accounts, the Kaliyuga will come to a close, together with the universe; and Mahâdeva is rather the representative of regeneration than of destruction. Indeed the worship of the type which represents him as the vivifying principle, the

linga (phallus, a smooth black stone in the form of a sugar-loaf, with a projection at the base like the mouth of a spoon), is spread all over India, and the number of worshippers of this image is far greater than the worshippers of all the other gods. (Ward, i. 16.) The linga is indeed the only form under which Siva is now adored in most parts of India. According to Professor Wilson ('Vishnu Purâna,' xliv.), 'There is nothing like the phallic orgies of antiquity; it is all mystical and spiritual. The linga is twofold, external and internal. The ignorant, who need a visible sign, worship Siva through "a mark" or "type," which is the proper meaning of the word "linga," of wood or stone; but the wise look upon this outward emblem as nothing, and contemplate in their minds the invisible inscrutable type, which is Siva himself. Whatever may have been the origin of this form of worship in India, the notion upon which it was founded, according to the impure fancies of European writers, is not to be read even in the Saiva Purâna.'

The linga however is only the type of Siva as the god who presides over generation. His other forms are many, and they vary in so far as they attribute to him the qualities of creator, preserver, destroyer, and regenerator, and represent him in his various *avatâras* (incarnations), eight of which are called by the common name of Bhairava, and are severally termed Asitânga, Ruru, Chandra, Krodha, Unmatta, Kûpati, Bhîshana, and Sanhâra, all alluding to terrific properties of mind or body. 'He is sometimes represented with two hands, at others with four, eight, or ten, and with five faces; he has a third eye in his forehead, the corners of which are perpendicular, which is peculiar to him; a crescent in his hair, or on his forehead, encircling the third eye; he wears earrings of snakes, and a collar of skulls.

Sects of Saivas.—The *Dandis* are separated into two classes. 1. The *Dandis* proper are the only legitimate representatives of the fourth asrama, or mendicant life, into which the Hindoo is to enter after passing through the previous stages of student, householder, and hermit. (Manu, vi. 33.) They worship Siva as Bhairava. The ceremony of initiation consists in a small incision being made in the inner part of the knee, and in drawing the blood of the novice as an acceptable offering to the god. 2. The *Dasnâmi Dandis* admit only Brahmans into their fraternity, and are the primitive members of the Dandi order. Sânkara, the teacher of the caste, has perpetuated his influence by writings, the best of which are his Bhâshyas, or Commentaries on the Sûtras (aphorisms) of Vyâsa, and on the Bhagavad-Gîta. They are distinguished by carrying a small dand (or wand), whence they derive their name, and a piece of cloth died with red ochre. They shave their hair and beard; wear only a cloth round their loins; and subsist upon food obtained ready dressed from the houses of the Brahmanas. Their principal study is that of the Vedanta works. ('Asiatic Researches,' xvii. 169.)

The other sects are the *Raudras*, *Ugras*, *Bhâktas*, *Jangamas*, *Pâsupatas*, and others, each of which wears the linga on some part of the dress or person, and are distinguished from each other accordingly. This sign is often worn in small cases of silver or brass. (Dubois, i. 147.) Their occupations are generally similar to those of the Dandis. Their scriptural authorities are the Siva-Gîta, Siva-sanhita, Siva-harasya, Rudra Samoha Tantra, and a great number of Tantras which are little known.

Among the chief places of pilgrimage sacred to Siva is Kasi, or Benares, which contains the finest temple, known under the name of the Pagoda of Vis'wes'wara. Chandra Sekhara, a mountain near Chittaganga, on which stands a temple of Siva, is another place of pilgrimage. The surface of a pool of water at this place is said to emit inflammable air, from the fire of which pilgrims kindle their burnt offerings. According to a statement of Ward (ii. 130), Ekamrakanana, a place on the borders of Orissa, contains 6000 temples. Not less than 70,000 or 80,000 people are said to visit this place at the drawing of the car of Jagannâtha, when all castes eat together.

The bull is the animal which receives the greatest veneration among the Saivas. A day in the week is consecrated to it.

The worshippers of Siva are distinguished from the rest of the Hindoos by burying their dead instead of burning them.

SIVAS, a town in Asia Minor, on the north bank of the river Kizil-Irmák, in 39° 25′ N. lat. and 36° 55′ E. long. It is the capital of a pashalic, which comprehends the whole eastern part of Asia Minor. The valley of the Kizil-Irmák, the ancient Halys, here spreads out into a broad and fertile plain. The situation being level, with the exception of only one small circular elevation, the whole town is seen to much advantage when approached from the north. It is interspersed with trees and gardens, like most of the towns in these parts. The houses are well-built, partly tiled, and partly flat-roofed. There are numerous minarets, and the bazaars are extensive and well stocked with goods, including many of British manufacture. Sivas is inhabited by about 6000 families, of whom about 1000 are Armenians, and the rest Moslems. The place was once called Cabira, a name that was changed to Diopolis by Pompeius, and subsequently to Sebaste. Sivas is a corruption of the word Sebaste.

SIWAH is the modern name of the oasis in the Sahara, which was called by the Greeks and Romans *Ammonium* from the celebrated oracle and temple of Jupiter Ammon, with whose worship the Greeks became acquainted through the Cyrenæans. Siwah is in 29° 12′ N. lat., and 26° 17′ E. long., and is about 160 English miles from the sea-coast, and twelve days' journey from Cairo. The whole oasis is about 15 geographical miles in length and 12 in breadth. Nearly the whole of it has a fruitful soil, and is watered by many springs of fresh as well as of salt water. The oasis is an undulating country, and on the north it is surrounded by high lime-stone hills. The whole is one uninterrupted succession of meadows, fields, and groves of palm-trees; and the gardens produce delicious fruits. Near the modern village of Shargiah is the Fountain of the Sun,

often mentioned by ancient writers, which has a varying temperature. The inhabitants are Berbers mixed with negroes. They pay a tribute to the pasha of Egypt. The principal place, called Siwah, has about 8000 inhabitants.

There are ruins of the ancient Temple of Ammon; and the paintings, sculptures, and hieroglyphics on the walls have been described and copied in the work of Minutoli, who visited Siwah in 1820.

SIXTH, a musical interval, a concord, the ratio of which is 5 : 3. There are three kinds: the *Minor Sixth*, the *Major Sixth*, and the *Extreme Sharp Sixth*. The first (E, C) is composed of three tones and two semitones; the second (C, A) of four tones and one semitone; the third (C, A♯) of four tones and two semitones.

SIXTUS I., II., III. [POPE.]

SIXTUS IV. (*Cardinal Francesco della Rovere*), a Franciscan monk, succeeded Paul II. in 1471. He supported the conspiracy of the Pazzi against Lorenzo de' Medici, which however failed of its principal object, for Lorenzo was saved, and the conspirators were put to death. The clergy of Florence took the part of Lorenzo, and being assembled in convocation or synod held for the occasion, they signed an act of accusation proving Sixtus to have been accessory to the conspiracy and the murder of Giuliano de' Medici. This curious document, the original of which, in the handwriting of Gentile d'Urbino, bishop of Arezzo, exists in the archives of Florence, is given by Fabroni and Roscoe in their respective biographies of Lorenzo. Sixtus induced Ferdinand, king of Naples, to join his troops to the papal forces against Florence, but losing this ally, and alarmed at the same time at the progress of the Turks, who had landed at Otranto, he was fain to agree to a reconciliation with the Florentines. In 1482 Sixtus entered into another intrigue with the Venetians, for the purpose of depriving Duke Ercole of Este of his dominion of Ferrara, which he wished to bestow upon Count Girolamo Riario, one of his nephews. This led to a war, in which the King of Naples and the Florentines supported the Duke of Ferrara against the Pope and the Venetians. The Emperor however interposed, upon which Sixtus thought it advisable to detach himself from the Venetians, and make a separate peace with the Duke of Ferrara. In 1484 the Venetians made peace also, and a few days afterwards Sixtus died.

SIXTUS V. (*Cardinal Felice Peretti of Montalto*) succeeded Gregory XIII. in 1585. He embellished Rome with numerous and useful structures, among others the present building of the Vatican library. He published a new edition of the Septuagint, 1587, and one of the Vulgate with improvements, 1590; and he himself edited the works of St. Ambrose. Sixtus died in August, 1589.

SIZAR, a term used in the University of Cambridge for a class of students who are admitted on easier terms as to pecuniary matters than others. These pecuniary advantages arise from different sources in different Colleges, and are of different value. Originally certain duties were required of the students so admitted, approaching to the character of menial, but these have been long discontinued. A similar class of students at Oxford are called *Servitors*. The word is supposed to be derived from *size*, which is used in the University to denote an allowance of provisions at the college buttery; and that from the verb to *assize*, which is much the same as the modern *assess*, which means *apportion*.

SKATE. This name, as well as the term Ray, is used in England to designate numerous fishes with cartilaginous skeletons, having the body much depressed and more or less approaching to a rhomboidal form. The eyes and temporal orifices are on the upper surface, and the mouth, nostrils, branchial and anal apertures, are situated on the under surface of the body; the tail is long and slender, generally furnished with two (analogues of the dorsal fins) and sometimes three fins, and usually armed with spines. The peculiar form of the skate arises chiefly from the great size and expansion of the pectoral fins; these extend from the head to the base of the tail, and are dilated in or near the middle in such a manner as to give (combined with the pointed snout) that rhomboidal form so peculiar to these fishes. The jaws are as it were paved with teeth, and these approach more or less to a rhomboidal form, and are flat, but in the adult males (at least of many of the species) those nearest the centre assume a pointed form.

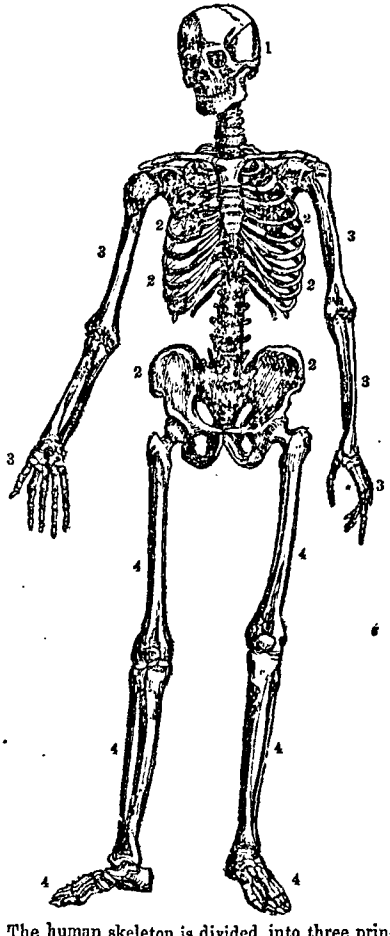
The young of the skate, says Mr. Yarrell, are produced towards the latter part of the spring or during summer. They are deposited by the parent fish in their horny cases, like those of some of the sharks; but they are more square in form. These horny cases of the young skates are by some called purses, and on the coast of Cumberland have the name of Skate-Barrows, from the resemblance they bear to a four-handed machine by which two men carry goods. As the young skate increases in size, the angular parts of the body are curved over.

Nine species of skates, or rays, are found on the British coast, the distinguishing characters of which are carefully pointed out in Mr. Yarrell's 'History of British Fishes.'

SKELETON (the Greek σκελετὸς) is the name applied to those harder parts of organised bodies which form the framework upon which the softer tissues are fixed. It is more particularly applied to the collection of bones which in an animal either serve as fixed points for the attachment of the soft parts, or form cavities for inclosing and protecting important organs, or constitute the apparatus of support and the passive instruments of voluntary motion.

The skeleton of man may serve as a standard with which to compare those of other animals. On this comparison of skeletons many of the most important facts of comparative anatomy depend; for the bones, being the least destructible of the tissues, are the most convenient organs to examine in the different classes of the higher animals; and in accordance with the rule of the exact adaptation of all the parts of an organised body to each other, the skeleton of each animal affords general indications

of the characters of every other organ in its body. And not only so; but each bone, according to the same rule, affords indications of the characters of the rest of the skeleton, and therefore, though less certainly, of the other organs of the body. Hence it is that, by an examination of a part of the skeleton of an extinct animal, geologists are enabled to form very probable suppositions of the form of the whole; knowing by certain marks on the bones, that they served for the attachment of muscles of corresponding form and strength, and that these muscles were adapted for peculiar movements, which again were most probably employed for certain purposes closely connected with the mode of life and the whole adapted organisation of the animal.



The human skeleton is divided into three principal parts: the Trunk (2), the Head (1), and the Extremities (3 and 4). Neither the whole number of bones composing it, nor that in each main division, can be exactly stated, for many which are in early life separated, are subsequently united; but as an approximation, the following enumeration may be adopted:—cranium, 8; face, 14; internal ears, 8; vertebral column, 24; chest, 26; pelvis, 11; upper extremities, 68; lower extremities, 64; in the whole, 223.

The Trunk is composed of the Spine or vertebral column, the Chest, including the ribs and sternum or breast-bone, and the Pelvis, the circle of bones on which the spine rests. The spine is the column of bones which, in the erect posture, supports the head on its summit, and rests with its base upon the sacrum. It consists of 24 bones, called vertebræ (from *verto*, I turn), because it is their motion upon each other which enables the trunk to be turned round. Of the 24, the 7 upper are called cervical vertebræ, the 12 middle dorsal vertebræ. and the 5 lowest lumbar vertebræ. With the exception of the two first, they are all connected by interposed discs of a very elastic substance, the intervertebral cartilages.

The general character of the vertebræ may be best studied on one from the lumbar region; in which the following parts, common to nearly all of the 24, are well marked:—a body, a ring, a spinous process, two transverse processes, four articulating processes, and four notches.

The human vertebral column forms a kind of pyramid, with its base at the sacrum, and its truncated summit at the head. It is not however regularly pyramidal; for, as seen from the front, it becomes gradually smaller from the base to the fourth dorsal vertebra; then it widens to the seventh cervical, and then again becomes narrower to the second. In the adult it has well-marked curvatures. From the head it is first curved slightly forward to the last cervical vertebra; then its dorsal portion forms an arch with its convexity backwards and ending at the last dorsal; and then again in the lumbar region it arches forwards to the base of the last lumbar vertebra. These directions of the column have relations to the naturally erect posture of the human body.

The spine serves several offices in the economy. One is that of guarding the spinal marrow, which, with the roots of its nerves, is inclosed in the long canal formed by the superposed rings of the several vertebræ. The spini-cerebrate form of nervous system, which consists of a brain and longitudinal axis, both placed on the same side of the digestive canal, is intimately connected with all the rest of the organisation of the animals in which it exists; and being always inclosed in a skull and spinal canal, the vertebral column is taken as the most obvious character of the four classes of animals which have this plan of nervous system. These therefore, namely, mammals, birds, fish, and reptiles, are called vertebrata; and the other portion of the animal kingdom, whatever be the plan of their nervous centres, invertebrata.

The spine is also the main support of all the rest of the skeleton. The head, the ribs, and the pelvis directly articulate with it; and through the medium of the pelvis and sternum, it suspends both the lower and upper extremities. It is the passive instrument of all the motions of the trunk, and the centre about which each of the limbs as a whole is moved. For these purposes it is adapted by combining firmness with flexibility and lightness. Flexibility is obtained by its being com-

posed of so many pieces separated from each other by layers of elastic tissue; and its strength is secured by these layers, which are at the same time firm bonds of union, and by numerous other strong ligaments passing from bone to bone. In its own movements, extent is combined with security by each vertebra (except the first) having but little motion on those next to it; the larger movements being the result of the combination of a number of such small ones. The directions of the processes and the diverse modes in which they are locked one within another, determine the degrees in which, in each part of the column, the several motions of flexion and extension in all directions, and of rotation, can be performed. The pyramidal form of the whole is adapted to the accumulated weight which the lower vertebræ have to bear. The curvature in the back increases the capacity of the chest. The spinous and transverse processes especially serve for the attachments of muscles of the head, chest, back, shoulders, and pelvis. The elastic cartilages interposed between the bodies break the shock of any violence upon one end of the body, and both they and the interlaminar ligaments tend to keep the spine straight, and so diminish the muscular action necessary to hold the body erect.

The base of the spinal column rests on the top of the sacrum, which, though commonly described as part of the pelvis, is indeed a continuation of the column, and is composed of five or six rudimental vertebræ, which after about the tenth year become consolidated. The sacrum has a triangular outline, the base being above; and it articulates with the last lumbar vertebra, so as to form an obtuse angle, the promontory, by means of an intervertebral substance and the other parts common to the rest of the vertebral joints. The lower end of the sacrum has a plain oval surface, which is fitted to the upper surface of the first bone of the coccyx, which is the lowest part of the whole vertebral column.

The sacrum and coccyx form the middle posterior part of the pelvis; its sides and front are formed by the bones called ossa innominata. Each of these is in the young subject composed of three parts, which are usually described separately, as the ilium, or haunch bone, the ischium, and the pubes. These three meet at the acetabulum, the hemispherical cavity in which the head of the thigh bone is lodged.

The general purposes served by the pelvis are—to support the abdominal viscera, to inclose and guard those in its own cavity, to give insertion to muscles of the abdomen, back, and thighs, and to be such an intermedium between the rest of the trunk and the lower limbs that the latter may move freely and yet firmly support the body. For the first three of these purposes its adaptation is obvious. For the last, the pelvis is fitted by its posterior half forming an arch on whose summit the spine is supported, and whose pillars rest on the heads of the thigh bones. Of this arch the sacrum, impacted between the ilia and held firmly by the ligaments of the symphysis, forms a kind of key-stone, fitted tightly enough to bear, through the medium of the spine, the weight of the trunk

and of great additional burdens. The pillars of the arch are terminated by the acetabula, which rest on the femora; and the direction in which the weight is thus transmitted from the sacrum to the thighs is that in which the strongest and thickest part of the ilium (in the line of the brim of the pelvis) is placed. Each acetabulum forms part of a sphere, hollowed out at the meeting of the three component bones of the os innominatum. Its depth is increased at the upper and back part (where the chief pressure falls) by the swelling out of the ilium; and all round, by the cotyloid ligament, a band of tough fibrous tissue, by which the bone is bordered. It in a measure envelopes the head of the femur, which is fitted into it air-tight, and so closely that even after all the ligaments are removed, they cannot without much force be separated. In the dry bones however the border of the acetabulum is not a complete circle; there is a notch where the ischium and pubes meet at the fore and lower part, to which the round ligament is in part attached. The head of the femur thus moves in the freest manner in the acetabulum by a perfect ball-and-socket joint; and if the thigh-bones be fixed, then it is by the rolling of the pelvis on their heads that the body is swayed *en masse*. The pelvis, in reference to its share in the processes of gestation and parturition, is larger in all its dimensions in women than in men.

The last main division of the trunk is the Chest or Thorax, composed of the dorsal vertebræ behind, the sternum in front, and the 12 ribs and their cartilages on either side. All the ribs articulate with the spine, but only the 7 uppermost on each side have distinct connections with the sternum; these are therefore called True Ribs, and the five lower on each side False Ribs. Of these last, the 3 upper have their cartilages united before they reach the sternum; and the two lower, which are sometimes called floating ribs, have short cartilages which are not attached to the sternum at all.

The sternum, or breast-bone, is single only in the adult; in youth it is composed of at least two pieces, and in the fœtus of many more. Considered as one bone, its form is elongated, broader and thicker above than below, where it terminates in a long narrow process, which is generally cartilaginous, and is named the ensiform or xiphoid cartilage. The anterior surface of the sternum is marked by four transverse lines which indicate the divisions between the five principal parts of which it is composed. These marks are repeated on the posterior surface. Along its borders there are (proceeding from above downwards), first, at each of the angles between its upper and lateral edges, a shallow depression into which the extremity of the clavicle is received; then immediately below this an oval depressed surface to which the cartilage of the first rib is fixed; and lastly, along each side six other similar surfaces separated by notches with which the cartilages of the six following ribs articulate. Of these six, the upper four are placed at the ends of the transverse lines; so that each of these ribs articulates at its sternal end with two pieces of the sternum,

just as, at its other extremity, it articulates with two vertebræ.

The general structure of the chest, and its adaptation to the movements of breathing, the most important function in which it is particularly engaged, are described in the article RESPIRATION.

The bones of the skull are divided into two chief sets, those of the cranium, or case for the brain, and those of the face.

The bones of the cranium are, the frontal, the two parietal, the two temporal, the occipital, the sphenoid, the ethmoid: those of the face are, the two nasal, the two superior maxillary, or upper jawbones, the two palate, the two malar, the two lachrymal, the two inferior turbinated, the vomer, and the inferior maxillary.

The frontal bone forms the forehead and roof of the front of the head. The parietal bones form all the upper and middle part of the skull. The temporal bones are placed in the middle; lateral; and inferior parts of the skull. The occipital bone forms the posterior and lower part of the middle of the skull, a portion being at the outer wall and a portion at the base. The sphenoid bone is placed in the middle of the base of the skull, and has a very complicated form. The ethmoid bone is situated in the front and middle part of the base of the skull, between the orbits.

The six bones thus described enclose the brain, forming a cavity whose size, compared with that of the crania of brutes, is one of the most distinguishing marks of the human species. To the protection of the important organs within it, as to their chief office, everything in the structure and arrangement of the bones of the cranium is adapted. Those parts of them which lie exposed to direct external injury are formed of three layers, namely, an outer and inner table, and an intermediate diploe*. The outer table is formed of bone of ordinary compactness, such as is not liable to be cracked by moderate shocks; the inner, of much harder and more brittle bone (whence its name of Tabula Vitrea), which may be more easily cracked, but less easily cut or pierced. The diploe is of a soft spongy tissue, calculated to lessen the vibrations that are produced by blows on the outer table before they reach the inner and more brittle one. The arrangement is thus similar to that by which one might safely enclose a substance liable to injury either from being shaken or cut, within an inner case of hard porcelain, a middle one of soft leather, and an outer one of tough wood. The formation of the sutures seems to have the same end. The outer tables of the exposed bones have their edges finely dovetailed, and are thus so immovenbly held together that none but a violently expansive force exercised at once on the whole interior of the cavity can separate them. The inner tables are simply apposed with a very thin intermediate layer of cartilage; an arrangement which, as Sir Charles Bell (who has written most ingeniously on this subject in his 'Animal Mechanics'), says, is often imitated in works of art, in which tough materials, such as wood, are joined by mutually-fitting dentations; and brittle ones, such as glass or marble, by smooth edges and a layer of cement. A similar mode of opposition is seen between all the bones of the skull that are not exposed to direct violence.

The top of the skull presents transversely an arch formed by the two parietal bones, whose most prominent parts, like those of the frontal, occipital, and others, are stronger and thicker than any others; a circumstance adapted for greater resistance to force, whether applied directly against those parts, or to the summit of the arch from which it would fall chiefly on them. The strength of this arch is further secured by the lower parts of the parietal bones being held in by the overlapping upper borders of the temporal and sphenoidal bones, other parts of which, passing across the base of the skull, hold the parietal bones, which by pressure from above might be made to start outwards or be pushed inwards, as beams hold the walls of a house from being driven either in or out by the weight of the roof. Taking the whole upper part of the skull as a dome, the same strength of resistance to superincumbent pressure is obtained at every part by nearly similar means, especially at the coronal suture, where the parietal bones overlap the frontal at the supports of its arch, and are themselves overlapped by it at the summit of their own. In this regard also may be noticed the strength and thickness of the angular processes, and of the orbital arches extended between them, which serve as supports for the front of the dome; and the thickening of the bones along the course of the longitudinal and lateral sinuses resembling groins in masonry. [BRAIN; EAR.]

The second chief division of the skull includes the bones of the face. The nasal bones form the upper part of the bridge of the nose. The superior maxillary or upper jaw bones form the greater part of the front of the face. The palate bones are placed backward between the superior maxillary and the pterygoid processes of the sphenoid bone. The malar or cheek bones form the most prominent part of the cheeks. The lachrymal bones are two small thin lamellæ of bone at the fore part of the inner wall of the orbit. The inferior turbinated or spongy bones are thin rough lamellæ, whose lower border is rolled up somewhat like a scroll. They lie within the nasal cavities. The vomer is a thin quadrilateral plate which forms a considerable part of the middle partition of the nose. The inferior maxillary, or lower jaw bone, has a form something like that of a horse-shoe.

The last main division of the skeleton consists of the upper and lower extremities. The upper are composed of the scapula, clavicle, humerus, radius, ulna, carpus, metacarpus, and fingers.

The scapula, or shoulder-blade, is triangular in its outline, and flat, being formed of two compact layers, and an intermediate diploe, varied in thickness. The scapula is attached to the trunk only through the medium of the clavicle, and by

* This arrangement does not exist in either the child or the old person. In the former all the bones are tough and elastic; in the latter the diploe is filled up by hard bone, and the whole cranium is therefore more liable to fracture.

the muscles which connect it to the spine and ribs. It can therefore slide freely on the back of the chest; and, to a certain extent, it follows all the larger movements of the humerus.

The clavicle, or collar-bone, extends transversely from the notch in the upper angle of the sternum to the anterior and outer margin of the acromion. With both of these its ends are articulated with a moderate extent of mobility; with the sternum, by the apex of a broad triangular surface; with the acromion, by a small flat oval surface on its posterior edge. The chief purpose of the clavicle is to keep the arm at a distance from the trunk for all its outward motions; and in adaptation to this, its length and strength form one of the most characteristic features of the human skeleton.

The humerus, the bone of the upper arm, is articulated above with the scapula by a hemispherical smooth portion called the head, which is bounded at its outer and lower part by a narrow groove called the neck. Close by the neck, the upper and outer part of the shaft is surmounted by two tuberosities: the larger and posterior has three flat surfaces, to each of which a muscle from the scapula is attached; the lesser gives attachment to the subscapularis muscle. The rest of the upper part of the shaft is round and nearly smooth; but just above the middle of its outer surface is a rough elevation, to which the deltoid, the chief muscle of the shoulder, is attached. About half-way down, the shaft begins to be flatter and wider, and at either border of it commence sharp ridges, which, as they descend, become prominent, and which terminate below at the external and internal condyles, each of which gives insertion to a ligament and several muscles of the fore-arm.

The fore-arm contains two bones, the radius and the ulna: the former being that with which the movements of rotation are effected; the latter, that which takes the chief part in flexion and extension. The radius, when the palm of the hand is turned forwards, is on the outer side of the arm; and it is the shorter of the two bones. The ulna is situated on the inner side of the fore-arm. The motions of which the fore-arm is capable are flexion and extension, and rotation on its axis. The two former are effected by a hinge-like joint at the elbow, which affords the best specimen of a hinge-joint in the body; for no lateral motion is permitted in it, the ulna being locked in the groove between the two side-ridges of the trochlea. Rotation, by which also the rotation of the hand is effected, is performed by the upper head of the radius moving round in a ring formed by the coronary ligament and the lesser sigmoid cavity of the ulna; and by its lower head at the same time being carried round on the outer border of the lower head of the ulna.

The hand consists of the carpus, metacarpus, and fingers. The carpus is composed of eight small bones arranged in two rows, and so nearly immoveably united by ligaments, that, except in being more elastic, they serve the purpose of a single bony arch. The bones of the carpus articulate with the radius directly and with the ulna indirectly. The metacarpus is composed of five bones, which are in immediate contact with the upper ends of the bones of the fingers. The bones of the fingers are called phalanges. The thumb has two, and each of the fingers three. They are articulated with each other, and with the metacarpal bones, so as to permit free extension and flexion.

The general arrangement of the bones of the human upper extremity is adapted to a far more extensive and varied set of movements than exists in the corresponding member of any other animal; they have all relation to the office of the hand, as an instrument not of support, but of prehension, and that in its most perfect form.

Each of the lower extremities is formed by a femur, tibia, fibula, and patella.

The femur, or thigh-bone, is the largest of the body. It articulates with the acetabulum of the os innominatum by its head, which forms rather more than half a sphere, and is smooth, except at its summit, where there is a depression for an interarticular ligament. It rests upon a narrower part, the neck, which descends obliquely to the summit of the shaft, and is at its base somewhat expanded. It is here set between two strong processes called trochanters, by which the shaft is surmounted. The greater trochanter is the uppermost, and lies at the outer part of the bone; it is thick, rough, and strong, and gives attachment to the great muscles of the buttock. Behind it is a deep depression, the digital fossa, in which the obturator and other muscles to rotate the thigh outwards are attached. The lesser trochanter is on the inner aspect of the femur, and also gives a point of insertion for muscles.

The tibia, or shin-bone, is placed on the front and inner part of the leg. Its upper part or head is far larger than any other. The lower part rests on and is articulated with the astragalus.

The fibula is situated at the outer part of the leg, and is fixed immoveably by the side of the tibia. It is long, very slender, for the most part three-sided, and enlarged at either extremity.

The patella, or knee-pan, has a somewhat triangular outline. Its narrowest part is below, and is fixed by the ligamentum patellæ to the tubercle of the tibia.

The bones of the foot consist of the tarsus, metatarsus, and toes. The tarsus is composed of seven bones, namely, the astragalus, os calcis, navicular bone, cuboid bone, and three cuneiform bones. These are set together so that they cannot be moved by any slight force, and yet are possessed of considerable elasticity. The astragalus is that on which, through the tibia, which rests upon its upper quadrilateral surface, the weight of the body first falls. The os calcis is the heel-bone. The tarsus and metatarsus together contribute to form an arch, of which the supports are the os calcis behind and the ends of the metatarsal bones before. It is indeed a double arch, for it has at the sole a concavity, both from before backwards and from side to side; and the strength with which its parts are joined is so great, that few accidents are rarer than a fracture or dislocation of any of the bones of the tarsus.

The rest of the bones of the foot, including those of the metatarsus and the toes, are in number, arrangement and form very similar to the metacarpus and the phalanges of the fingers. The metatarsal bones however are longer, more slender, and set more closely side by side than the metacarpal; and the phalanges are all much shorter, and (except the two of the great toe) smaller. Their movements are in general the same as those of the fingers, but less extensive; neither is there any adaptation for so free a movement of the first toe as there is of the thumb.

There are some supplemental bones of the skeleton, which need but just be mentioned. These are the sesamoid bones and the hyoid bone. The former occur within the substance or in the course of tendons which are much exerted. The patella is the largest of them; the number and existence of the others are not certain, but there are almost always two at the first joints of each of the thumbs and great toes; they are small, oval, or round, and rough on all their surfaces, except that by which they articulate with the bone on which they lie. The hyoid bone is that on which the larynx is suspended and the base of the tongue fixed; it is not articulated, except by long ligaments, with any other of the bones.

SKELTON, JOHN, was born some time in the latter part of the 15th century. Very few particulars of his life are known. The first mention of him is in the preface to Caxton's translation of the 'Æneid,' printed in 1490, where he is said to have been lately created poet-laureate in the 'Unyversite of Oxenforde.' Skelton was ordained deacon in 1498, by the bishop of London, and priest the following year. In 1507 he was rector of Diss in Norfolk, and curate of Trompington in Cambridgeshire. In the reign of Henry VIII., if not during the lifetime of his predecessor, he was appointed Orator Regius, as he styles himself in the title to several of his poems, though whether with any salary does not appear.

Skelton became notorious from his coarse and bold invective against Cardinal Wolsey and the clergy in general, but according to tradition his own conduct as a priest was far from being creditable. He was esteemed, observes Wood ('Athenæ Oxon.'), in his parish and the diocese more fit for the stage than the pew or pulpit. He is said to have been suspended by the bishop of Norwich, having been guilty of 'certain crimes, as most poets are.' The severe attack upon Wolsey in the poem, 'Why come ye not to Court?' drew down upon him the resentment of that great ecclesiastic, who ordered him to be arrested. Skelton took sanctuary at Westminster, under the protection of Abbot Islip, to whom, in 1512, he dedicated the 'Præconium Henrici Septimi.' He died in this retreat, June 21, 1529.

The chief of his other poems are the 'Crowne of Lawrell' and the 'Bouge of Courte,' two cold and tedious allegories; and the 'Boke of Colin Clout,' 'Ware the Hawk,' &c., which are attacks upon the whole body of the church. Skelton has been called original and inventive. He is rather unique. In style there is no known writer throughout our literature to whom he can be compared. His poems present a strange mixture of ribaldry, learning, malice, and buffoonery, unrelieved by any traces of the higher qualities of satire.

SKERRIES. [Antrim.]

SKEW-BRIDGE, a bridge in which the passages over and under the arch intersect each other obliquely. Where space and neatness do not require to be considered, an oblique arch may be avoided, either by building the bridge square with the upper passage, and making the span so wide as to allow the stream to pass under it without being diverted; or by building the arch square with the stream, and of sufficient length to allow the upper passage to take an oblique course over it; but either of these is a clumsy expedient, although well adapted for some situations.

Very little is known respecting the origin of skew-bridges. It has been repeatedly asserted that those built by George Stephenson on the Liverpool and Manchester Railway were the first erections of the kind; but this is not correct. They were, however, the first in which the scientific principles of the method were properly applied. On that railway, out of rather more than sixty bridges, about one-fourth were built on the skew; one, built of stone, conducting the turnpike-road across the line at Rainhill, being at an angle of only 34 degrees, by which the width of span is increased from 30 feet, the width of the railway from wall to wall, to 54 feet, the width on the oblique face of the arch. In the skew-bridge at Boxmoor, the angle is 32°, the square span 21 feet, and the oblique span 39 feet. The difficulty of building skew-bridges increases with the obliquity of the angle from 90° to 45°, which is supposed to be the most hazardous angle for a semicircular arch; but beyond that point, instead of increasing, it rather diminishes to about 25°, which appears to be about the natural limit for a semi-cylindrical arch. Elliptical oblique arches are deficient in stability, more difficult to execute, and more expensive, than semicircular or segmental arches.

The construction of skew-bridges of iron or timber is comparatively simple, the ribs or girders of which such bridges are composed being of the usual construction, laid parallel with each other, but the end of each being in advance of that next preceding it. The extraordinary iron bridge by which the Manchester and Birmingham Railway is conducted over Fairfield Street, Manchester, at an angle of only 24½°, is a fine example of this kind of skew-bridge. It consists of six ribs, of rather more than 128 feet span, although the width of the street is only 48 feet, resting upon very massive abutments of masonry.

SKIBBEREEN. [Cork.]

SKIMMER. [Rynchops.]

SKIN. The skin is the outer covering of the body; and having to serve at once as a defence for the more deeply seated structures, as an organ of touch, and as an apparatus for secretion, it is one of the most compound of all the tissues. It is composed of two chief parts:—a vascular basis named *Cutis*, and a superficial layer named *Epidermis* or *Cuticle*, which is not vascular.

The cutis is made up for the most part of fibres and laminæ, like those of common cellular tissue. The external surface of the skin presents a variety of wrinkles. The larger of these are produced by the action of muscles, which in many parts throw the skin into folds; others result from its loss of elasticity in old age, and the removal of the fat beneath it; and again others, which are seen most plainly on the palms and the balls of the fingers, and on the corresponding parts of the foot, run in very close parallel arches, and indicate the arrangement of subjacent rows of sensitive papillæ, with which the whole surface of the skin is beset, and which in the parts just named, and in some others, are arranged in regular double lines. In their most developed state, on the balls of the fingers for example, the papillæ are very fine conical processes, standing somewhat obliquely, and so densely set that their summits form a seemingly smooth surface. On these parts each elevated line which one sees on the surface has beneath it two rows of papillæ; for when looked at closely, each such ridge shows on its summit a little furrow dotted with minute apertures, and which fits into the space between the rows of papillæ. Over the rest of the body the papillæ are much smaller, and are irregularly arranged. Everywhere however they are the most vascular part of the skin, each papilla receiving a distinct loop from the subjacent network of blood-vessels. It is in them also that the greater part of the very numerous nerves of the skin terminate; for though every part of the skin be sensitive, yet the papillæ are so in the highest degree, and are the chief instruments by which the sense of touch is exercised.

The chief secretory apparatus of the skin consists of the perspiratory glands, which are disposed over its whole extent, but, like the papillæ, are largest and most numerous in the palms and soles. These glands are composed of spiral tubes, opening on the surface of the epidermis, and as the whole superficies of the body is 14 square feet, it is probable that, as Eichhorn calculated, there are not less than ten millions of these glands scattered through the skin.

It is in them that the perspiration is being constantly formed, though it most generally passes away as fast as it is produced in an invisible vapour, and during health collects in the form of sweat only when it is very rapidly formed, as during active exercise, or when the surrounding atmosphere is already saturated with moisture.

Another secretion from the skin is that of the oily sebaceous matter by which its surface is always kept in a slight degree greasy, so that water adheres to it only in drops, and does not easily soak into the substance of the epidermis. This secretion is produced by the sebaceous glands, as well as the hair-follicles on which they are almost always attendant. [HAIR.]

The loss of fluid by these secretions from the skin is in some measure compensated by the absorption which it also exercises. It is uncertain how much, if any, of the vapour of the atmosphere is thus imbibed; but it is certain that the skin absorbs fluids placed for a short time in contact with it, and this so rapidly, that (especially after long fasting) a perceptible increase of weight is observed after a person has been in a bath.

Besides its secretions, there are produced from the vessels of the skin materials of which are formed certain appendages for its protection and other purposes, such as the cuticle, the hair, and the nails.

The cuticle, or epidermis, is an insensible and non-vascular membrane, which is laid over the whole of the external surface of the body in a layer, and is composed of several layers of cells: of the two layers into which it may commonly in an ordinary dissection be split, the lower is called Rete Mucosum, or Rete Malpighii, the upper and outer more particularly epidermis. It is composed entirely of cells.

The epidermis is the seat of the characteristic natural colours of the skin, as well as of the colours of freckles and other superficial marks. In dark-complexioned races, especially in negroes, it is very thick, and its cells are filled with minute black or otherwise coloured pigment granules, many of which also lie loose among them. The thickness of the epidermis in these tribes renders it less penetrable by the rays of heat; and it is hence (and not on account of its colour, which would have an opposite effect) that a negro can bear the exposure of his skin to a degree of solar heat which blisters that of a European.

SKINK. [ADDA.]

SKINNER, STEPHEN, born 1623, died 1667, a skilful physician and a very learned philologist. He was born in London or the neighbourhood; studied in the University of Oxford, where he was a commoner of Christ Church; but the civil war coming on, he left Oxford without taking a degree, and travelled abroad, occasionally remaining some time at the foreign universities. In 1646 he returned to Oxford, and took the usual academical degrees; after which he again went abroad, and lived in France, Italy, Germany, and the Netherlands. He took the degree of M.D. at Heidelberg, and afterwards at Oxford, in 1656. He then settled at Lincoln, where he engaged in the practice of medicine with great success; but he died in September 1667. He had applied his great philological knowledge to the construction of an etymological dictionary of the English language. The work, which he left incomplete, was published after his death by Thomas Henshaw in 1671, in a folio volume, under the title of 'Etymologicon Linguæ Anglicanæ.' The work, though it had not received the author's final corrections, is useful. The etymological part of Dr. Johnson's dictionary is almost wholly derived from Skinner and Junius.

SKIPTON. [YORKSHIRE.]

SKIRRET. [SIUM.]

SKULL. [SKELETON.]

SKUNK. [WEASELS.]

SKY is the name commonly applied to the infinite space which surrounds the earth, and of which the visible portion, above the horizon of a spectator on any part of the earth's surface, appears to have the form of a concave segment less than a hemisphere.

The earth is surrounded by the atmosphere, which is charged with vapours and terrestrial particles; and, the sun's light entering obliquely into it, the violet and blue rays, or those which are conceived to have less momentum than the red rays, are partially arrested in their course, and are reflected in abundance to the earth. They thus, when the atmosphere is nearly free from clouds, give to the parts of the sky which are remote from the apparent place of the sun an azure tint; while, if the sun be near the horizon, the blue rays in the beams of light which traverse the atmosphere in that direction are absorbed, so that those only, as the yellow and red, which have greater momentum, arrive at the eye of the spectator: in consequence of this the sky near the horizon, on the side which is towards the sun, appears to be highly tinted with those colours. Many of the blue rays, after reflection from the upper parts of the atmosphere, are however absorbed in passing down to the earth; and hence it is that the blue tint of the sky is found to increase in intensity as the spectator ascends above the general surface of the earth.

That the blue tint of the sky is caused by light reflected in the atmosphere is abundantly evident from the fact that the light of the sky is found to be polarised: this quality in light being a result of its reflection. Dr. (Sir David) Brewster, who first made the observation, has moreover ascertained that the light of the sky consists of two parts, one blue and the other nearly without colour; and he discovered that these lights are polarised in different directions.

For the description of an instrument invented in order to measure the intensity of the blue colour of the sky, see CYANOMETER.

SKYLIGHT. Including under this term every mode of admitting light into an apartment through its roof or ceiling, we may here briefly notice that particular fashion of skylight distinguished in gothic architecture by the name of Lantern, though lanterns in gothic buildings were not so much intended to admit light as to supply ventilation and the means of escape to smoke. But the term lantern is also applied to the lower part of a tower placed at the intersection of the transepts with the body of a church, which, being open below, forms a loftier portion of the interior, lighted by windows on each side; and again to an upper open story, that is, one entirely filled with windows, on the summit of a tower, and frequently forming a superstructure different in plan from the rest, as at Fotheringay Church, and that at Boston, Lincolnshire, in both which examples the lantern forms an octagon placed upon a square. The upper portion of the tower of St. Dunstan's, Fleet Street, London, may also be described as a lantern.

Of skylights however, properly so called (that is, which are nearly in the same plane as the general surface of the ceiling), no examples are to be met with in our ancient architecture; nor does anything of the kind occur in Italian architecture, except it be in the form of a cupola over a central saloon.

The only instance that we are acquainted with of a church lighted entirely from above, without lateral windows, is that of St. Peter-le-Poor, Broad Street, London, which is a rotunda, covered by a cove, and a large circular lantern, whose tambour forms a sort of clerestory, consisting of a continuous series of arched windows, while the ceiling makes a very flat or slightly concave dome. Soane was, we believe, almost the first who attempted to give importance and decorative character to skylights and ceiling windows, or windowed ceilings, as they may be termed, making them ornamental features in his interiors, varied in their design, and producing great diversity of striking effects, occasionally heightened by the light being transmitted through tinted glass, so as to diffuse a warm sunny glow over the apartment. The offices at the Bank of England afford many studies of the kind, while his own house, in Lincoln's Inn Fields, shows what he accomplished by a similar mode of treatment, upon a very limited scale. The form of sky-lights more generally used for picture galleries, libraries, and other apartments of that class, is of the simplest kind, being lanterns, not like those in gothic architecture, of narrow and straight proportions, but spacious and low, and occupying a considerable surface of the ceiling. The light is admitted through the sides of the lantern, which are mostly filled in with panes of glass, so as to form a window continued on every side, without other divisions than the bars in its framework. Of other forms of lanterns and skylights in picture-galleries and sculpture-galleries, examples are furnished by those at the British Museum and the National Gallery, London, and the Fitzwilliam Museum at Cambridge, some of which are double skylights, a smaller skylight being raised over the first one.

There are a variety of other modes of lighting rooms from their ceilings, depending in a great measure on the taste and skill of the architect, and the necessities frequently imposed by the situation or purpose of the building.

SKYROS, an island in the Ægean, in 39° 10′ N. lat. and 25° 12′ E. long. It is 15 miles in length in a N.W. and S.E. direction, and is divided into two nearly equal parts by an extensive bay called Kalamitza or Gran Spiaggia, on the west side of the island, and by another, called Port Akhili, on the east side. The southern part of the island is rugged and mountainous: Mount Kokheles, the highest peint, is 2566 feet above the sea. The summits of the hills are covered with oaks, fir, and beech trees. The northern part of the island is less mountainous, and it contains some good land, but it is very imperfectly cultivated. The population was only 2630 in 1848. Some corn, wheat, and barley are exported, and also madder roots. Skyros now belongs to the kingdom of Greece; but, though the island has great capabilities, it makes slow progress towards improvement. It was an old tradition that Achilles lay hid there, disguised in female attire, before the war of Troy. The capture of it by Achilles is mentioned by Homer ('Il.,' x. 664); and the name of this hero is still preserved in that of Port Akhili. In B.C. 476 Skyros was

taken by Cimon, the inhabitants were enslaved, and an Athenian colony was sent there.

Leake's 'Travels in Greece' contain a full account of the island, its history and antiquities. Its present condition (1848) has been described by Capt. Graves, 'Journal of the London Geographical Society,' vol. xix.

SLANDER consists in the malicious speaking of such words as render the party who speaks them in the hearing of others liable to an action at the suit of the party to whom they apply. The mere speaking of the defamatory words instead of the writing of them is that which constitutes the difference between Libel and Slander: [LIBEL.]

Slander is of two kinds: one, which is actionable, as necessarily importing some general damage to the party who is slandered; the other, which is only actionable where it has actually caused some special damage. The first kind includes all such words as impute to a party the commission of some crime or misdemeanor for which he might legally be convicted and suffer punishment, as where one asserts that another has committed treason, or felony. It also includes such words spoken of a party, with reference to his office, profession, or trade, as imputé to him malpractice, incompetence, or bankruptcy. If a party is in possession of lands which he desires to sell, he may maintain an action against any one who slanders his title to the lands; as by stating that he is not the owner. With respect to the second kind of slander, the law will not allow damage to be inferred from words which are not in themselves actionable, even although the words are untrue and spoken maliciously. But if, in consequence of such words being so spoken, a party has actually sustained some injury, he may maintain an action of slander against the person who has uttered them. In such case the injury must be some certain actual loss, and it must also arise as a natural and lawful consequence of speaking the words.

In answer to an action of slander the defendant may plead that the words spoken were true, or that they were spoken in the course of a trial in a court of justice, and were pertinent to the case; or formed the subject of a confidential communication, as where a party on application bonâ fide states what he believes to be true relative to the character of a servant, or makes known facts merely for the purpose of honestly warning another in whom he is interested. (Com. 'Dig.,' 'Action on the Case for Defamation,' D. 1, &c.)

SLATE. By some geological writers the laminar structures which prevail in many stratified and in some metamorphic rocks are called slaty or schistose; but, in consequence of the progress of investigation, one of these structures, locally superinduced in deposited strata, which is characterised by planes of cleavage generally meeting those of deposition at considerable angles, is specially called the slaty structure. The slaty cleavage appears to be the result of a general cause acting subsequently to the deposition and disturbance of the strata, capable of pervading and re-arranging the particles so as to polarise and

systematise their mutual attractions, but not to fuse them together, destroy their original distinctness, or obliterate the evidence of their original condition. This force was so general, that along many miles of country, as, for example, in the whole Snowdonian chain, one particular direction, (north-north-east), in North Devon and Pembrokeshire another (nearly east and west), is found to prevail more or less distinctly in all the rocks. This dependence of the slaty structure on the nature of the rock is sometimes very positively pronounced, as in some classes of rock the cleavage does change and even reverse its inclination where contortions prevail. Pressure, in some peculiar application, seems to be the grand agent in the production of slaty cleavage.

For economical purposes there appears little chance of obtaining in the British Islands good Slate (properly so called) from any but the ancient argillaceous strata superposed on mica schist and gneiss, and covered by old red-sandstone or mountain limestone. From these strata in Scotland, Cumberland, Westmorland, Yorkshire, Charnwood Forest, North Wales abundantly, South Wales, Devonshire, Cornwall, the north and south of Ireland, slates of various value are dug. The thin flagstone of the coal formation in many parts of England and Wales, the laminated sandy limestone of Stonesfield, Collywiston, &c., which are often called slates, and are extensively used in roofing, are all obtained by natural partings parallel to the stratification. True slate is split by wedges from the apparently solid rock along planes often no more discoverable than those of a real crystal. In colour it is purple, blue, green, yellowish, or almost white, or striped across the planes. In some slates (west of Scotland, Ingleton, &c.) crystals of cubical iron pyrites are scattered. Much of the Cumberland slate (Borrowdale) appears full of fragments.

SLAVE, SLAVERY, SLAVE TRADE. The word slavery has various acceptations, but its complete meaning is the condition of a human being who is the property of another or others. Such was the condition of the 'servi,' or slaves among the Romans and Greeks; such is still that of the slaves in eastern countries, and that of the negro slaves in many parts of Africa and America. A mitigated form of this condition exists in the case of the serfs in Russia and Poland, and of a similar class in India and some other parts of Asia. The Russian and Polish serf is bound to the soil on which he is born; he may be sold or let with it, but cannot be sold away from it without his consent; he is obliged to work three or four days a week for his master, who allows him a piece of land which he cultivates. He can marry, and his wife and children are under his authority till they are of age. He can bequeath his chattels and savings at his death. His life is protected by the law. The slave of the Greek and Roman nations was transferred at his owner's pleasure; he could acquire no property; all that he had was his master's; all the produce of his labour belonged to his master; he could not marry; and if he cohabited with a woman, he could be separated from her and his children at

any time, and the woman and children sold. The villeins (villani) of the middle ages were a kind of serfs, but their condition varied considerably according to times and localities. In the present article we treat only of the real slave of ancient and modern times.

Slavery, properly so called, appears to have been, from the earliest ages, the condition of a large proportion of mankind in almost every country, until times comparatively recent, when it has been gradually abolished by all Christian states, at least in Europe. The condition of slavery constitutes one great difference between ancient and modern society. Slavery existed among the Jews: it existed before Moses in the time of the Patriarchs: and it existed, and still continues to exist, in many parts of Asia. The Mosaic law regulated the condition of slavery. It drew a wide distinction between the alien slave and the native servant. The latter could not be a perpetual bondman, but might be redeemed; and if not redeemed, he became free on the completion of the seventh year of his servitude. Again, every fifty years the jubilee caused a general emancipation of all native servants.

In ancient times prisoners, if not killed, were reduced to slavery, being either distributed among the officers and men of the conquering army, or sold. Another source of slavery was the practice of kidnapping men and women. The Phœnicians and the Etruscans had the character of being men-stealers; and also the Cretans, Cilicians, Rhodians, and other maritime states. Herodotus (v. 6) states that some of the Thracian tribes sold their children to foreign dealers.

Among the Greeks slavery existed from the heroic times, and the purchase and use of slaves are repeatedly mentioned by Homer. The labours of husbandry were performed in some instances by poor freemen for hire, but in most places, especially in the Doric states, by a class of bondmen, the descendants of the older inhabitants of the country, who lived upon and cultivated the lands which the conquering race had appropriated to themselves; they paid a rent to the respective proprietors, whom they also attended in war.

The Doric states of Greece had few purchased slaves, but Athens, Corinth, and other commercial states had a large number, who were mostly natives of barbarous countries. The slave population in Attica, in the time of its greatest power, was more numerous than the freemen. There were private slaves belonging to families, and public slaves belonging to the community or state. The latter were employed on board the fleet, in the docks and arsenal, and in the construction of public buildings and roads.

The ancients were so habituated to slavery, that none of the Greek philosophers make any objection to it. Plato, in his 'Perfect State,' desires only that no Greeks should be made slaves.

The Greeks considered slavery to be founded on permanent diversities in the races of men. (Aristotle, 'Polit.,' i. 5.) The Romans admitted in principle that all men were originally free ('Instit.,' i., tit. ii.) by natural law (jure naturali), and they ascribed the power of masters over their

slaves either to the 'jus gentium,' that is, the universal usage of all nations, if the slaves were captives taken in war; or to the 'jus civile.' It was a rule of Roman law that the offspring of a slave woman followed the condition of the mother. ('Inst.,' i. tit. 3.) Emancipation was much more frequent at Rome than in Greece: the emancipated slave became a freedman (libertus), but whether he became a Roman citizen, a Latinus, or a Dediticius, depended on circumstances.

Slaves had no rights, and were in most respects considered as things or chattels. They had no connubium, that is, they could not contract a Roman marriage; their union with a person of their own rank was styled contubernium; and even the Christian church for several centuries did not acknowledge slave marriages. At last the Emperor Basilius allowed slaves to marry and receive the blessing of the priest, and Alexius Comnénus renewed the permission.

Public slaves were those which belonged to the state or to public bodies, such as provinces, municipia, collegia, decuriæ, &c., or to the emperor in his sovereign capacity, and were employed in public duties, and not attached to his household or private estate. Public slaves of an inferior description were employed as rowers on board the fleet, or in the construction and repair of roads and national buildings. Those of a superior description were employed as keepers of public buildings, prisons, and other property of the state, or to attend magistrates, priests, and other public officers, as watchmen, lictors, executioners, watermen, scavengers, &c.

Private slaves were generally distributed into urban and rustic; the former served in the town houses, and the others in the country. Long lists of the different duties performed by slaves of each class are given by Pignorius, 'De Servis et eorum apud Veteres Ministeriis,' Amsterdam, 1674; Popma, 'De Operis Servorum,' ibid., 1672; and Blair, 'An Inquiry into the State of Slavery amongst the Romans,' Edinburgh, 1833. For all the necessities of domestic life, agriculture, and handicraft, and for all the imaginable luxuries of a refined and licentious people, there was a corresponding denomination of slaves. Large sums were occasionally paid for slaves of certain peculiar kinds, some of which we should consider the least useful.

There was a brisk slave trade carried on during the later Republic and the Empire from the coasts of Africa, the Euxine, Syria, and Asia Minor. The island of Delos was at one time a great mart for slaves, who were imported thither by the Cilician pirates. (Strabo, p. 668, Casaub.) The Illyrians procured numerous slaves for the Italian market, whom they bought or stole from the barbarous tribes in their neighbourhood. But the chief supply of slaves was derived from Asia and Africa. In most countries it was customary for indigent parents to sell their children to slave dealers. Criminals were also in certain cases condemned to slavery, like the galley-slaves of our own times.

In the later period of the Empire free-born persons of low condition were glad to secure a

subsistence by labour on the estates of the great landowners, to which, after a continued residence for thirty years, they and their families became bound by a tacit agreement under the name of Coloni, Rustici, Adscriptitii, &c. The phrase 'servi terræ,' which is applied to them shows their connection with the soil. They could marry, which slaves could not. Though they bear a considerable resemblance to the serfs and villeins (villani) of the middle ages, yet there are some important points of difference, and there is no evidence of any historical connection between the Coloni and Villani. The subject of the Coloni is discussed by Savigny, 'Ueber den Römischen Colonat;' 'Zeitschrift für Geschichte; Rechtswissenschaft,' vol. vi.; and 'Vermischte Schriften.'

The number of slaves possessed by the wealthy Romans was enormous. Some individuals are said to have possessed 10,000 slaves. Scaurus possessed above 4000 domestic and as many rustic slaves. In the reign of Augustus a freedman who had sustained great losses during the civil wars left 4116 slaves, besides other property.

A master had the power of manumitting his slave, which he could effect in various forms; but several enactments were passed which limited the power of manumission.

In the earlier ages of the Republic slaves were not very numerous, and were chiefly employed in household offices or as mechanics in the towns. But after the conquests of Rome spread beyond the limits of Italy, the influx of captives was so great, and their price fell so low, that they were looked upon as a cheap and easily-renewed commodity, and treated as such. The condition of the Roman slave, generally speaking, became worse in the later ages of the republic and under the empire; and many of the emperors, even some of the worst, interfered on behalf of the slave. The Christian emperors went further. Constantine placed the wilful murder of a slave on a level with that of a freeman; and Justinian confirmed this law, including within its provisions cases of slaves who died under excessive punishment. After Christianity became the predominant religion in the Roman world, it exercised in various ways a beneficial influence upon the condition of the slaves, without however interfering, at least for centuries, with the institution of slavery itself.

The northern tribes which invaded the Western Empire had their own slaves, who were chiefly Slavonian captives, distinct from the slaves of the Romans or conquered inhabitants. In course of time however the various classes of slaves merged into one class, that of the 'adscripti glebæ,' or serfs of the middle ages, and the institution of Roman slavery in its unmitigated form became obliterated. The precise period of this change cannot be fixed; it took place at various times in different countries. Slaves were exported from Britain to the Continent in the Saxon period.

But although the traffic in slaves ceased among the Christian nations of Europe, it continued to be carried on by the Venetians across the Mediterranean in the age of the Crusades. The Venetians supplied the markets of the Saracens with slaves purchased from the Slavonian tribes which

bordered on the Adriatic. Christian captives also taken by Mussulmans were sold in the markets of Asia and Northern Africa, and continued to be sold till within our own times, when Christian slavery has been abolished in Barbary, Egypt, and the Ottoman Empire, by the interference of the Christian powers, the emancipation of Greece, and the conquest of Algiers by the French.

With the discovery of America, a new description of slavery and slave-trade arose. Christian nations purchased African negroes for the purpose of employing them in the mines and plantations of the New World. The natives of America were too weak to undergo the hard work which their Spanish task-masters exacted of them, and they died in great numbers. Las Casas, a Dominican, advocated with a persevering energy before the court of Spain the cause of the American aborigines, and reprobated the system of the 'repartimientos,' by which they were distributed in lots like cattle among their new masters. But it was necessary to have labourers for the settlements to be made profitable, and it was suggested that negroes from Africa, a more robust and active race than the American Indians, might be substituted for them. The Portuguese were at that time possessed of a great part of the coast of Africa, where they obtained by force or barter a considerable number of slaves. The demand for slaves by the Portuguese in the Atlantic harbours gave the trade a fresh direction. The petty chiefs of the interior made predatory incursions into each other's territories, and sold their captives, and sometimes their own subjects, to the European traders. The first negroes were imported by the Portuguese from Africa to the West Indies in 1503, and in 1511 Ferdinand the Catholic allowed a larger importation. These however were private and partial speculations. Charles V. granted to one of his Flemish courtiers the exclusive privilege of importing 4000 blacks to the West Indies. The Fleming sold his privilege for 25,000 ducats to some Genoese merchants, who organised a regular slave-trade between Africa and America. It is generally admitted that the slaves of the Spaniards, especially in Continental America, were the best treated of all. But the negro slaves in general were exactly in the same condition as the Roman slaves of old. Restrictions however were gradually introduced by the laws of the respective states, in order to protect the life of the negro slave against the caprice or brutality of his owner. In the British colonies, especially in the latter part of the last century and the beginning of the present, much was done by the legislature; courts were established to hear the complaints of the slaves, flogging of females was forbidden, the punishment of males was also limited within certain bounds, and the condition of the slave population was greatly ameliorated. Still the advocates of emancipation objected to the principle of slavery, and they also appealed to experience to show that a human being cannot be safely trusted solely to the mercy of another.

But long before they attempted to emancipate the slaves, the efforts of philanthropists were directed to abolish the slave traffic, which desolated

Africa. The attention of mankind was first effectually awakened to the horrors of this trade by Thomas Clarkson. His labours, with the aid of the zealous men, chiefly Quakers, who early joined him, prepared the way for Mr. Wilberforce, who brought the subject before parliament in 1788. But the question of abolition was repeatedly defeated, until 1804, when Mr. Wilberforce first carried the Bill through the Commons: it was thrown out in the Lords, and next year it was again lost even in the Commons. Meanwhile the capture of the foreign colonies, especially the Dutch, during the war, increased the amount of the trade, by opening these settlements to British capital; and at one time the whole importation of slaves by British vessels amounted to nearly 60,000 yearly, of which about a third was for the supply of our old colonies. At length, in 1805, an order in council prohibited the slave-trade in the conquered colonies; and in 1807 the trade was abolished by act of parliament. This act prohibited slave-trading from and after the 1st of January, 1808; but as it only subjected offenders to pecuniary penalties, something more was required to put down the traffic. In 1810 the House of Commons, on the motion of Mr. Brougham, passed unanimously a resolution, pledging itself early next session effectually to prevent 'such daring violations of the law;' and he next year carried a bill making slave-trading felony, punishable by fourteen years' transportation, or imprisonment with hard labour. In 1824 the laws relating to the slave trade were consolidated, and it was further declared to be piracy, and punishable capitally, if committed within the Admiralty jurisdiction. In 1837 this was changed to transportation for life.

The first French law abolishing the slave-trade was a decree issued by Napoleon on the 29th of March, 1815, during the Hundred Days, after his return from Elba. It prohibited any vessel from fitting out for the trade, either in the ports of France or in those of her colonies; and the introduction or sale in the French colonies of any negro obtained by the trade, whether carried on by French subjects or foreigners. The influence of Great Britain was again strenuously exerted at the peace in 1815, to obtain the concurrence of foreign powers in the abolition; and the object has been steadily kept in view by this country. The consequence has been that now nearly all the powers in Europe and America have passed laws, or entered into treaties, for prohibiting the traffic.

A complete list of the treaties and conventions for the suppression of the slave-trade that have been made by this country with other states since the general peace is given in the 'Penny Cyclopædia,' art. 'Slavery.'

The 'History of the Abolition of the Slave Trade' is contained in the work under that title by T. Clarkson (edition 1834), and the state of the law, as well as the treatment of slaves practically in the colonies, is fully treated of in a work on that subject by Mr. stephen. The writings of the late Sir John Jeremie also contain much useful information on the condition of slavery in the British colonies just before the Emancipation Act.

In 1834 the British parliament passed an act, by which slavery was abolished in all British colonies, and twenty millions sterling were voted as compensation-money to the slave-owners (3 & 4 Wm. IV. c. 73). No other nation has imitated the example. The emancipated negroes in the British colonies were put on the footing of apprenticed labourers. By a subsequent act (1 Vic. c. 19) all apprenticeships were to cease after the 1st of August, 1840, but the day was anticipated in all the West Indian colonies by acts of the colonial legislatures. Slavery exists in the French, Dutch, Spanish, and Portuguese colonies, and in the southern states of the North American Union. The new republics of Spanish America, generally speaking, emancipated their slaves at the time of the revolution. As the slave population in general does not maintain its numbers by natural increase, and as plantations in America are extended, there is a demand for a fresh annual importation of slaves from Africa, which are taken to Brazil, Cuba, Puerto Rico, and Monte Video. In a work, 'The African Slave-Trade and its Remedy,' by Sir T. Fowell Buxton (who, after Mr. Wilberforce's retirement, took a most active part in parliament on the subject of slavery), it is calculated, apparently on sufficient data, that not less than 150,000 negro slaves are annually imported from Africa into the above-mentioned countries in contravention to the laws and the treaties existing between Great Britain and Spain and Portugal, the local authorities either winking at the practice or being unable to prevent it. Since the slave-trade has been declared to be illegal, the sufferings of the slaves on their passage across the Atlantic have been greatly increased, owing to the means taken by the slave-traders to avoid the British cruisers. It is said that the slaves are often thrown overboard in a chace. The loss in the middle passage is reckoned on an average at one-fourth of the cargo; and, besides this, there is a further loss, after landing, in what is called the 'seasoning' of the slaves.

There is a considerable internal slave-trade in the United States of North America. Negroes are bred and sold in Maryland and Virginia, and some other of the slave-holding states, and carried to the more fertile lands of Alabama, Louisiana, and other southern states.

It appears that the African slave-trade cannot be effectually put down by force, and that the only chance of its ultimate suppression is by civilising central Africa, by encouraging agricultural industry and legitimate branches of commerce, and at the same time spreading education and Christianity; and also by giving the protection of the British flag to those negroes who would avail themselves of it. It is certain that if other countries will not exert themselves, the abolition must be postponed to this remote period. The Africans sell men because they have no other means of procuring European commodities, and there seems no doubt that one result of the slave-trade is to keep central Africa in a state of barbarism.

Societies for the ultimate and universal abolition of slavery exist in England, France, and the United States, and they publish their Reports;

and a congress was held in London, June, 1840, of delegates from many countries to confer upon the means of effecting it. The American Society has formed a colony called Liberia, near Cape Mesurado, on the west coast of Africa, where negroes who have obtained their freedom in the United States are sent, if they are willing to go. The English government has a colony for a similar purpose at Sierra Leone, where negroes who have been seized on board slavers by English cruisers are settled.

SLAVE-COAST. [GUINEA.]

SLAVONIA. By the constitution of the Austrian Empire, promulgated March 4, 1849, the divisions of Dalmatia, Croatia, Slavonia, the Croatian Litoral, and the town and territory of Fiume are united to form the Crownland of the Kingdom of Dalmatia. With the exception of Dalmatia, all these countries formerly belonged to Hungary. The area and population of the crownland are as follows:—

Provinces.	Area in sq. miles.	Pop. in 1842.
Dalmatia . .	4918	401,541
Croatia . . .	3650	506,500
Slavonia . .	3628	336,100
Fiume . . .	133	44,790
Total . .	12,329	1,288,931

Of these divisions, Dalmatia and Croatia have been already noticed; the Croatian Litoral and the territory of Fiume, described under CROATIA, are now joined to Slavonia, which it remains to notice.

Slavonia is bounded W. by Croatia, N. and E. by Hungary, and S. by Turkey. It is separated from Hungary by the Drave and the Danube, from Turkey by the Save, and it has the Illowa on part of the western frontier. The territory thus bounded is divided into two parts, the province of Slavonia, and the Slavonian Gränzland or Borderland. *The Province of Slavonia* is divided into the three counties of Posega, Verovicz or Veröcze, and Sirmia. A chain of high mountains coming from Croatia traverses the province. Where this chain enters the province the valleys are narrow, but they gradually become more open towards the middle of the province, and form near Posega a wide plain bounded by lofty mountains, which is called the Posega Valley; but at the eastern frontier of this county, the branches of the mountains again join in one principal chain, reaching the height of 2800 feet, which covers all the northern part of the county of Sirmia. This chain is covered with vast forests. The remaining part of Slavonia consists partly of fertile eminences planted with vines and fruit-trees, and partly of beautiful and extensive plains. But as many tracts of land on the Save and Drave are very low, they are subject to be frequently overflowed, and there are several large and small pieces of stagnant water, and extensive marshes. Along the right bank of the Danube there are forests in many places; and the course of the Save is densely shrouded with them. These forests contain a vast quantity of excellent oak timber. The country produces corn of all kinds, hemp, flax, tobacco, and great quantities of liquorice. There are whole forests of plum-trees: chestnut, almond, and fig-trees are likewise common, and the white mulberry abounds. Slavonia is rich in useful domestic animals. The horses are small, and sheep are not numerous. Of wild animals, the bear, wolf, fox, pole-cat, and vulture are common. Swarms of troublesome insects are bred in the marshes, and a long continuance of southerly winds sometimes brings locusts. The only minerals of which there are considerable quantities are sulphur, limestone, coal, salt, and iron. It may be said that there are no manufactures in Slavonia. The peasant makes all his farming implements—his cart, his plough, &c.; and his wife and daughters weave the cloth and knit the stockings for the family. In so fertile a country agriculture and the breeding of cattle are the most profitable occupations of the inhabitants. The culture of silk is flourishing. The quantity of wine produced is very large; the county of Sirmia, where the vine was planted in the third century by the soldiers of the Emperor Probus, alone produces about 6,000,000 gallons annually. The wines, both red and white, are spirituous and not well-fitted for export. The exports are corn, tobacco, spirits distilled from plums, raw silk, honey, wax, liquorice, gall-nuts, madder, raw hides, oak staves, hoops, salt, oil, and fruit; oxen and swine are exported in large numbers. The trade is chiefly with Austria and Turkey. The chief imports are iron, salt, and oil.

Of the county of Posega, which is in the south-west of the province, the chief town *Posega* stands on the Orlawa, a feeder of the Save, and has a gymnasium, and 4500 inhabitants. Tobacco is extensively cultivated in the Posega Valley.

The county of Verovicz occupies the northern slope of the Reka Mountains, extending along the right bank of the Drave to its junction with the Danube. Its chief town is ESZEK, or *Essek. Diacovar*, S. of Eszek, a small place of about 3000 inhabitants, and the seat of a bishop; *Verovicz* or *Veröcze*, in the north-west of the province, with a population of 3200; and *Dalka*, a village on the right bank of the Danube, are in this county.

In the county of Sirmia, which lies E. of the other two, and is traversed by the chain of hills that forms the watershed between the Danube and the Save, the soil is very fertile, except in the mountains of Karlowitz and Frusta Gora. It contains the towns of *Vukovar*, at the mouth of the Vuka; population, 6000; *Illok* or *Ujlak*, further down the Danube, here a mile wide; *Kamenitz*, 2 miles from Peterwardein; *Ireg*, in a fine wine country on the south slope of the Karlowitz Mountains: population, 5000; *Ruma*, 5 miles S. from Ireg, on a small affluent of the Save: population, 6200.

The Slavonian Gränzland or Borderland has an area of 2952 square miles, and a population of about 260,000, and extends with a breadth of 4 to 20 miles along both banks of the Danube, from Peterwardein to Semlin, and up the left bank of the Save to the junction of the Illowa. It

has an entirely military administration [MILITARY FRONTIER], and is divided into 3 regimental circles, named from the head-quarters of each regiment—Peterwardein, Brod, and Gradiska; besides these, there is the Tschaikist district, which furnishes the battalion that mans the small armed galleys (tschaiks) that cruise up and down the Danube, the Theiss, and the Save. This district, which was formerly included in the Hungarian county of Bacs, extends along the left bank of the Danube, between Neusatz and the mouth of the Theiss.

The chief towns of the Grünzland are PETERWARDEIN: *Karlowitz*, a town on the right bank of the Danube, with about 6000 inhabitants, which gives title to a Greek archbishop, who is the head of the Greek church in Austria; the peace between Austria and Turkey in 1699 was signed here: SEMLIN: *Mitrovitz*, on the Save, population, 3500: *Brod*, higher up the Save, population, 3700: and *Gradiska*, still farther up the same river. *Titel*, a small place of 2900 inhabitants, on the right bank of the Theiss, and not far from its junction with the Danube, is the head-quarters of the Tschaikist district.

SLAVONIAN LANGUAGES AND LITERATURE.—The Slavonian tongue contains a great number of Sanscrit roots, and it is accordingly considered to be related to the Indo-Germanic languages. All the Slavonian languages possess a rich vocabulary, and also a great number of prefixes and suffixes, by means of which an extraordinary number of new forms is made. By simply prefixing the letters s, z, v, w, the verb acquires different significations. The declensions, of which there is a great variety, are formed by the inflexion of the termination. The participles unite the qualities both of verbs and adjectives; and as verbal adjectives they denote at once the quality of the thing and the determination of the time, thus serving the use of relatives, as who, which, and prepositions, as after, &c. There are no auxiliary verbs. These languages possess a great facility of compounding words, and it is possible to form from native roots all the scientific terms which the languages of western Europe have derived from the Greek and Latin. They have the patronymic which is formed by the addition of *wich*, corresponding to *ides* and other forms in Greek. These languages have also the dual number. The verbs are conjugated without the use of pronouns; and the præterites of the third person singular and plural designate the sex by a variation in the last syllable. The Slavonian languages possess great expressiveness and energy, and in power and capability are not inferior to any European languages, and superior to many. As to sounds it may be observed that the Slavonian languages possess every sound that other languages contain, except the English *th*.

The *Russian Language* may be divided into three dialects, of which the dialect of Great Russia or Muscovy, since the time of Peter the Great, has been formed into the present literary language of Russia. It differs from the other Slavonian languages in having an admixture of words and sounds of Finnish origin, to which

circumstance is to be attributed its superior harmony, as compared with many other Slavonian languages, for the Finnish language is characterised by extraordinary softness. The history of the Russian language and literature may be divided into two periods, that before the time of Peter the Great and that since his time. The influence of Peter on the civilisation of Russia is one of the most remarkable events in the history of Europe. Since his time a new literature has been formed in Russia, which is rich in almost every department both of poetry and prose composition.

The *Polish Language* is considered to be more flexible and euphonic than the other Slavonian dialects. In conciseness of expression it is hardly inferior to any other language. The juxta-position of many consonants gives the language a harsh appearance to the eye, but the consonants are softened in the pronunciation and melted together. It is the only Slavonian language which has the French nasal sounds *en, on, in*. It comes nearer to the Bohemian than to any other of the kindred languages. The brilliant period of Polish literature begins with the 16th century, and extends to the early part of the 17th; and the accession of Sigismund I., in 1508, may be considered as its commencement. The Reformation gave a great impulse to thought, and the translation of the Bible into Polish tended to the improvement of the national language, just as the English and German translations have done in those two countries respectively. Polish literature, during its brilliant period, exhibited an extraordinary development of the national intellect. The Latin poets of this period also possess high merit, and show that the Latin language and literature must have been very successfully cultivated. The reign of Sigismund III., a narrow-minded bigoted king, produced an unfortunate change in the literary condition of Poland, his sole object, during a reign of forty years, being to extirpate all the confessions of faith which were opposed to that of Rome. But notwithstanding the decline of mental cultivation during this unhappy period, Poland produced some few authors of note; and, notwithstanding the troubled history of Poland since the reign of John Casimir, with the exception of the state of stupor in which it was sunk from 1717 to the death of Augustus III. in 1763, the Poles have distinguished themselves in most departments of literature. Even in the present political condition of Poland, the taste for their national literature still exists undiminished among the Poles.

The national *Literature of Bohemia* is older than that of any other Slavonian country, and its monuments extend as far back as the tenth century. John Huss commenced a new period of literature for Bohemia as Luther did for Germany, and he introduced that simple orthography of the Bohemian language which is still used. Huss revised and corrected the old Bohemian version of the Bible, and also left behind him original compositions in the Bohemian language. Ziska, the celebrated leader of the Hussites, was also an author. The period from 1520 to 1620 is called by the Bohemians the

golden age of their literature, and indeed during that period science and literature were successfully cultivated in Bohemia. The decrees of the emperor Joseph II. (1774 and 1784), for the introduction of the German language into all the schools of Bohemia, seemed a severe blow to the Bohemian language and literature; but the measure appears to have awakened the slumbering energies of the nation, and to have stimulated it to new exertions. The improved system of public education (for though the imperial decrees established the supremacy of the German over the Bohemian language, they promoted the progress of knowledge) began to exercise a salutary influence on the study of the national language and its literature; and in the latter part of the 18th and in the present century, Bohemian literature has received many valuable additions from the labours of those who have attempted to regenerate their national literature.

The *Servian Language* has more resemblance to the Russian than to the Polish or Bohemian languages; and it is considered more melodious than any other Slavonian dialect. It is spoken by a population of about five millions. The oldest monuments of Servian literature date from the 13th century, though the language of these early monuments is not the Servian of the present day. There is a chasm of two centuries which followed the defeat of the Servians by the sultan Murad I., an event which destroyed the national independence of the Servians. The Servian was first employed as a written language by Dositheus Obradovich, who was born in 1739, and died in 1811 at Belgrade.

For a full sketch of the *Slavonian Language and Literature* the reader is referred to the article in the 'Penny Cyclopædia.'

SLAVONIANS. The Slavonian or Slavic race, which now extends from the Elbe to the Pacific, and from the northern ocean to the frontiers of China, Persia, and the Mediterranean, comprehends about 70,000,000 persons, divided into several nations, who speak various cognate dialects, and live within the dominions of Russia, Austria, Turkey, Prussia, and Saxony. According to Jornandes, the first writer who mentions the Slavonians, they were formerly called Venedi; and Pliny (iv. 13) says that they lived about the banks of the Vistula. Ptolemæus places them on the eastern shore of the Baltic, which he calls the Venedian Gulf. The Slavonians appeared on the borders of the Empire about 527, and having invaded the Greek provinces committed terrible ravages. They besieged Constantinople, and nobody dared to encounter them. Belisarius at last succeeded, more by presents than force, in removing this dangerous enemy. After that time they settled on the banks of the Danube, alternately ravaging the provinces of the Empire or serving in its armies. The Slavonians were conquered in the sixth century by the Avari, with the exception of those who were settled on the Danube; but the yoke of the Avari was at last broken by the Slavonians of Bohemia, who rose against their conquerors, and defeated them. In the seventh century, having concluded alliances with the emperors of Constantinople, they entered Illyria, and founded new colonies under the name of Slavonia, Croatia, Servia, Bosnia, and Dalmatia. The Greek emperors favoured their settling in the imperial provinces. In the seventh century there were Slavonian settlements on the River Strymon in Thrace, in the vicinity of Thessalonica, and in Moesia, or the modern Bulgaria. Many of them settled in the Peloponnesus, and a considerable number passed into Asia and settled in Bithynia and other provinces. At the same time Christianity began to spread among them. The sixth synod of Constantinople (A.D. 680) enumerates the Slavonians among the Christian nations.

Although the Slavonians who appeared on the borders of the Greek Empire were rude and uncivilised, those who lived on the southern shores of the Baltic had towns and enjoyed the advantages of a considerable commerce. Their chief cities were Ancona, on the island of Rügen, and Vineta, at the mouth of the River Oder. Adam of Bremen, who wrote in 1067, and Helmold, state that all the Slavonians were idolaters, that the original form of government was democratical, that the fathers of families had great authority over their wives and children, and that they met together occasionally to consult on the affairs of their community. With the progress of time, and probably also from the necessities created by their coming into contact with more civilised nations, the Slavonians introduced permanent authorities and chiefs. Many Slavonian communities came under the rule of hereditary chiefs or sovereigns; others elected their chiefs for life; whilst many retained their primitive democratic form, somewhat modified by circumstances.

The religion of the ancient Slavonians seems to have been different from that of the Teutonic nations; and it varied also considerably among themselves. Those on the Baltic coast acknowledged two principles—Biel Bog (the white or good god), and Cherni Bog (the black or evil god); the eastern Slavonians had a variety of gods, of whom the principal was Perun, the god of thunder.

The following are the Slavonian races now in existence:—

1. The Czechs, who inhabit Bohemia and Moravia, and are scattered in some parts of Hungary and Silesia.

2. The Poles, who inhabit the territory of ancient Poland, Silesia, and Prussia.

3. The Muscovites or Great Russians, who have a considerable admixture of Finnish blood. They inhabit the north-eastern provinces of Russia in Europe.

4. The Russians, who are distinct from the Great Russians or Muscovites, are divided into Little Russians, who inhabit the ancient Polish provinces of the Ukraine, Podolia, and Volhynia, now incorporated with Russia, a part of the kingdom of Poland, Galizia or Austrian Poland, and some parts of northern Hungary; and White Russians, who inhabit a part of Lithuania, chiefly the provinces of Mohilof and Witepsk, which were acquired by Russia at the first dismemberment of Poland, in 1772, as well as a part of the government of Smolensk.

5. The Slovacks, who inhabit the north of Hungary.

6. The Croats, who inhabit the south-west of Hungary.

7. The Illyrians, who inhabit the Austrian provinces of Carinthia, Carniola, and Dalmatia.

8. The Servians, who inhabit Servia, to whom may be added the Montenegrins.

9. The Bulgarians and Bosnians in Turkey, of whom a part have embraced Mohammedanism, while others profess the Christian religion according to the Eastern church.

10. The Wends, who are scattered over several provinces of Austria and Prussia.

SLEAFORD. [LINCOLNSHIRE.]

SLEEP. During sleep it is only the animal functions, or those performed by the muscles and nerves, which are suspended. The vegetative functions, as respiration, digestion, and circulation, go on as usual.

True sleep is peculiar to the mammalia and to birds; the lower animals, indeed, rest from time to time, and withdraw themselves from the external world, but having no external eyelids, they cannot exclude all influence from without. Fish conceal themselves behind a stone or near the bank of a river, crocodiles hide themselves in the mud, and tortoises creep into holes. The higher animals likewise usually seek out some place of retirement to sleep in, and dispose themselves in a posture which either is maintained with little muscular effort, or is favourable to the preservation of warmth.

Animals in general require less sleep than man; thus, for instance, four hours are sufficient for the horse. Those animals whose blood circulates very rapidly, whose motions are peculiarly energetic, and their senses very acute, usually sleep more lightly, and for a shorter time than others. The timid herbivorous animals sleep less, and less profoundly, than the bolder carnivora. In man the want of sleep varies at different ages; the new-born infant sleeps almost continually, while persons in middle life can do with less sleep than children or very old persons, and women require less sleep than men. From six to eight hours a day are usually passed in sleep, but habit exercises a great influence in determining the amount of repose required. John Hunter and Frederick the Great did not sleep for more than four hours daily, while some sluggish persons spend nearly half their time in sleep. In extreme old age much sleep sometimes becomes necessary. De Moivre, when eighty-three years old, was awake only during four hours out of the twenty-four, and Thomas Parr towards the close of his life was almost constantly asleep. Children sleep very soundly, old persons are easily disturbed, men sleep more profoundly than women, and sleep is always sounder after considerable weariness.

There are some conditions which favour the occurrence of sleep. Stout and full-blooded persons, and those of an excitable but easily exhausted frame, require more sleep than such as are thin, or who, though equally excitable, are more energetic, and less easily tired. Abundant food induces sleepiness, and also wine and other stimulants. A class of medicines is known by the name of narcotics, whose peculiar action is to induce sleep. Ease and quiet of mind conduce to it, but the weariness of hopeless grief is likewise followed by sleep. Certain external causes favour sleep, such as the warm bath or friction of the surface of the body. Extreme cold is a powerful and most dangerous narcotic; it induces a sleep from which there is no waking.

Sleep invigorates body and mind when worn out by toil, and the occurrence of sleep in the course of a disease is one of the most favourable signs of returning health. After a night's sleep we are nearly an inch taller than before; the intervertebral cartilages, which had been compressed by bearing the weight of the body during the day, having regained their natural form and proportions. The powers exhausted by our intercourse with the external world recover themselves during sleep, and our senses in the morning are alive to all impressions. It is however pre-eminently the rest of the brain, which, when fatigued by the constant action of the mind, becomes incapable of continuing that action, just as the eye, if long fixed upon one spot, ceases to perceive any object distinctly.

Hybernation, or Winter Sleep, occurs in some mammalia, in all the amphibia, and in some of the molluscous and insect tribes. Birds do not hybernate, and the vulgar notion with reference to the sleep of the swallow in winter is erroneous. Hybernation is either perfect or imperfect. In the former, of which the marmot affords an instance, the lethargy is profound and undisturbed by any sense of thirst or hunger, and the animals do not awake until the period of sleep is completely past. In the latter, intervals of wakefulness occur, during which the creatures rouse themselves and seek for food, as in the case of many insects and spiders, also the hedgehog, bat, and dormouse. The time during which hybernation continues varies much. In some animals it lasts for four months only; in others for five or six; but almost all awake either in March or April.

The approach of winter sleep is not sudden, but it comes on gradually; the activity of the animals diminishing as their sense of hunger grows less keen. In some animals, as in the hedgehog, a diminution or total loss of appetite precedes hybernation for some weeks. When hybernation is perfect, the senses become so completely blunted, that severe wounds and electric shocks are insufficient to rouse the animal.

The phenomena of organic life go on far more sluggishly during hybernation than in diurnal sleep. The pulsations of the heart sink to a fourth or in some cases a tenth of their natural frequency. The respiration becomes slow, intermits frequently and for a long time, or even becomes altogether imperceptible.

The *Sleep of Plants* is a condition first noticed by Linnæus to be general, though some of the phenomena had long been noted in the tamarind-tree, and in some leguminous plants with pinnated leaves, natives of Egypt.

As night approaches, flowers close, the leaves

of plants become more erect and fold themselves together, while vitality seems to retire from the periphery. Thus during sleep the leaves of the sensitive-plant lose their peculiar sensibility, which retires to the petiole. With the approach of night, too, an important change takes place in the functions of plants, for instead of exhaling oxygen and absorbing carbon from the atmosphere, as in the day time, their action at night is directly the reverse.

SLEEP-WALKING. [SOMNAMBULISM.]

SLIDE (or SLIDING) RULE. The Sliding-Rule is an instrument for the mechanical performance of addition and subtraction, which is converted into an instrument for the mechanical performance of multiplication and division by the use of logarithmic scales, instead of scales of equal parts.

This instrument has been greatly undervalued in our country, in which it was invented by Oughtred, about 1630, and is very little known on the Continent.

We cannot find space to enter upon the description of the sliding-rule with benefit to the learner. All we can do is to give those who have some acquaintance with the subject a few notes on the subject.

The following list of sliding-rules, now on sale in London, contains all or nearly all which can be useful to any one:—

1. Common Engineer's Rule, or Carpenter's Rule in its best form, is a double 12-inch rule, a slide of two radii with the same scale on one side, and a scale of one radius of double length on the other, with divisors (sold by all rule-makers). The newest description is Kentish's 'Treatise on a Box of Instruments,' &c., London, 1839.

2. Bevan's Engineer's Rule, 12 inches, has slides on both faces (which may be exchanged), and serves for squares, cubes, square roots of cubes, &c. There are scales on the backs of the slides and in the grooves, for sines, tangents, inverted numbers, compound interest and annuities at 5 per cent.

3. Henderson's Double-Slide Rule, 12 inches, has two parallel contiguous slides, with scales of numbers fixed above and below, and solves at one operation most sets of multiplications and divisions not exceeding five operations. At the back are tables of divisors for solids.

4. Woollgar's Pocket Calculator, 8 inches. The two slides work in either of the grooves: the backs and the grooves have scales of sines, tangents, areas of polygons, circular segments; interest, annuities, certain and for lives, at several rates of interest. An addition may be made by a metal slip, giving the solution of the same questions as the last rule.

5. Woollgar's Pocket-Book Rule, 6 and 8 inches, has two radii, one under the other, a line for sines, and duplicate proportions at the back of the slide. At the bottom of the groove are sometimes inserted lines for finding the relations of right-angled triangles, for cask gauging, and for cuttings and embankments.

6. Excise Officer's Sliding-Rule, modern form. Sold at the Excise Store-Office, and by some of the instrument-makers. The old Excise Rule was a thick block, with a slide on each face.

Among separate treatises are, Flower's, 8vo., London, 1768; Mackay's, 8vo., 2nd edit., London, 1811; do., Leith, 1812; 'Instruction sur la Manière de se servir de la Règle à Calcul.,' small 8vo., Paris et Dijon, 1825; 'The Universal Ready-Reckoner,' by an Idle Gentleman, 12mo., London, 1839. There is also a good deal on the subject in Ingram's 'Concise System of Mathematics,' 12mo., Edinburgh, 1830; and Bateman's 'Excise Officer's Manual,' 12mo., London, 1840.

SLIGO, a county of Ireland, in the province of Connaught, is bounded N. by the sea, N.E. by the county of Leitrim, S.E. by Roscommon, and S.W. and W. by Mayo. The greatest length E. and W. is 35 miles; the greatest breadth N. and S. is 34 miles. The area is 721 square miles. The population in 1841 was 180,886.

Coast-Line and Islands.—The coast from the mouth of the river Moy, at the western extremity of the county, runs along the southern shore of that great inlet of the Atlantic Ocean of which Donegal Bay, Sligo Bay, and Killala Bay are subordinate parts. Except in Sligo Bay and along the coast eastward from it the shore is rocky. Off that part of the coast which extends north-eastward from Sligo Bay, distant between three and four miles, is Innis Murray, a small island, about a mile long from east to west. It rises precipitously on every side except just at the east point, and contains about 209 acres of cultivable land, chiefly pasturage, and is inhabited by about a score families. About two or three miles farther out to sea are the Boabinshy Rocks. Sligo Bay is nearly 6 miles across at the entrance, and about 10 miles in length to the town of Sligo. Sligo Bay is divided into three subordinate bays, Drumcliff Bay on the N., Ballysadere Bay on the S., and Sligo Bay in the centre. The mouth of Sligo Bay (the smaller interior bay immediately in front of the town of Sligo) is protected by Coney Island (area 388 acres), which stretches across the entrance, and forms a natural breakwater, within which large vessels, which cannot get up to the town, lie at anchor. There is another much smaller island in the bay, called Oyster Island, on which are two lighthouses; and westward from Coney Island extends a reef, on the western extremity of which, the Black Rock, dry at low-water, a lighthouse has been built. There are extensive sands or other strands in Killala Bay and Sligo Bay, and along the coast eastward of Sligo Bay.

Surface and Geology.—The mountains of this county form three principal groups. The Ox Mountains extend from the river Moy at Foxford, in the county of Mayo, N.E. to the shore of Ballysadere Bay. The mountains which overspread the counties of Fermanagh and Leitrim extend into this county and occupy the N.E. border; these form the second group. The third group consists of such portions of the Braughlieve and Curlew Mountains, and the mountains round Lake Gara, as are in the county. The Ox Mountains form a considerable range, about 25 miles long and 5 or 6 in breadth. They consist chiefly

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of mica slate, with occasionally granite, hornblende slate, gneiss, and quartz rock. The summits have a mean height of 1300 feet above the level of the sea. At the base of the Ox Mountains the old red sandstone and conglomerate are observed skirting on both sides of the range the primary rocks, and sinking below the carboniferous limestone, which occupies the lower lands extending on one side to the sea and on the other to the Curlew Mountains on the borders of Roscommon. Of the mountains on the borders of Roscommon, the Braughlieve Mountains, which rise in one part 1346 feet above the level of the sea at low-water, belong to the carboniferous group, and the Curlew Mountains, which rise in one part 1062 feet above the level of the sea, to the old red-sandstone group. The rest of the county is occupied by the formations of the carboniferous limestone group. A ridge of mountains west of Lough Gara consists of the yellow sandstone which constitutes the lowest member of this group; but very little of this ridge, if any part of it, is within the county. This county and the adjacent one of Mayo are traversed by trap dykes unexampled for length, directness, and parallelism. Their direction is nearly east and west. Trachyte, a formation not observed elsewhere in the British Isles, is found on the shore of Killala Bay.

Copper and lead mines were formerly wrought in the primary district to which the Ox Mountains belong; but there are not any carried on at present. A considerable part of the district extending northward from the foot of the Ox Mountains to the sea is covered with bog; and there is a considerable extent of bog in the southern part of the county, but very little in the part which lies north of the town of Sligo.

Rivers and Lakes.—The western side of the county is watered by the Moy and other smaller streams which flow into Killala Bay, or into the open sea. The Owengarrow has part of its course in this county and part in Mayo. It joins the Moy above Foxford. The united stream touches the western border of the county just below the town of Ballina, and forms the boundary of the county of Sligo and Mayo, until it falls into Killala Bay. It is navigable for vessels of considerable burden up to Ballina. Nearly all the rest of the county is drained by the streams which flow into Sligo Bay, of which the most important are the Ballysadere, and the river Sligo or Garrogue, which, flowing from Lough Gill, passes the town of Sligo.

The lakes are tolerably numerous, and have an aggregate area of 20 square miles. Lough Gara, on the southern boundary, 222 feet above the sea at low-water, has an area in this county of 3684 acres, or above 5¼ square miles; Lough Arrow, in the south-eastern corner, 181 feet above the level of the sea, has an area in this county of 2977 acres, or 4½ square miles; and Lough Gill, on the eastern boundary, 20 feet above the level of the sea, has an area of 3131 acres, or nearly 5 square miles, in this county, besides a portion in the county of Leitrim. Among the small lakes are Lough Talt, Lough Easkey, in the Ox Mountains, Lough Car, or Glencar, partly in this county and partly in Leitrim, and Lough Gill, nearly 6 miles long, and about 2 miles wide.

Soil and Agriculture.—A considerable part of the soil, about 160,000 acres is occupied by unimproved bog or mountain; about 260,000 acres are under cultivation. In the north the soil is thin and poor, but it improves as we advance southward. The vicinity of Sligo is a plain of great fertility: in the west the soil is light and gravelly, with large tracts of bog. The usual course of tillage is potatoes followed by two white crops, then potatoes again, after which a few of the larger farmers allow the land to remain fallow; but among the smaller farmers the course is an alternate crop of potatoes and grain. It is only by the help of sea-weed used as manure, which is often carried 20 miles, that the land is enabled to bear this constant exhausting process. Near Sligo, lime and animal manure are used as well as sea-weed. The grazing farmers are generally men of more capital than the tillage farmers, but the pasture-land is commonly poor. The number of cows kept varies from one to ten. Not many sheep are kept, except by large farmers, and a few by those who hold mountain farms: no improvement has been made in the breeds kept by the farmers, but there has been an improvement in those kept by gentlemen. The large Irish breed, and the mountain breed, which is smaller, are the most common.

The cabins of the peasantry are of the most wretched description, built of sods or of loose stones, coated outside with a mixture of clay and mortar, with a clay floor, and a roof formed by laying branches of trees across the rafters, and covering them with sods of turf, over which is laid a thin and inadequate thatching of straw. The greater part are without chimneys, and are not large enough to be divided into apartments: a small pane of glass, kept in its place by mortar or mud, is the usual window; most have a wooden door on hinges, but others have wicker doors, and in a few the doorway is closed by a hanging of straw mats. Most have pigstyes or cowhouses, however wretched. Turf is the ordinary fuel, and constitutes a serious item in the expenditure of a poor family, when they have not liberty to cut it on the estate.

Divisions and Towns.—The county of Sligo is divided into 6 baronies. It is in the united diocese of Tuam, Killala, and Achonry. It is in the Connaught Circuit, and the assizes are held at Sligo. The county returns two members to parliament, and 1 member is returned for the borough of Sligo: total, 3 members.

The following are the principal towns, with the population of each in 1841:—

Ardnaree (population, 1699) is a suburb of *Ballina.* [MAYO.]

Ballymote, 14 miles S. from Sligo, is a small market-town, situated in a fertile and improving district. It contains a small sessions-house, a church, a large Roman Catholic chapel, and places of worship for Methodists and Presbyterians. Population, 839.

Ballysadere, 5 miles S. from Sligo, is a village situated on both banks of the river Ballysadere,

just above its outfall into Ballysadere Bay. There is a small pier, and vessels of 100 tons can come up to it. Population, 869.

Collooney, 7 miles S. from Sligo, in a village situated on the river Owenmore. It contains a church and a Roman Catholic chapel. Population, 651. A little below the village the river falls over a ledge of rocks, forming a beautiful cascade. It also drives two very large flour-mills.

Sligo, the county town, a parliamentary borough and a municipal borough, in 54° 22′ N. lat., 8° 22′ W. long., 131 miles N.W. from Dublin by the road, is situated on both sides of the river Garrogue where it falls into Sligo Bay. The river is crossed by two bridges. The left bank of the river below the old bridge, which is the lowest, is lined with quays and wharfs. The streets in the old parts of the town are narrow and ill-paved; but in the newer parts the streets are wider and well-paved, and there are convenient markets and many large stores. The town contains a county court-house, prison, infirmary, fever-hospital, union workhouse, two churches, a Roman Catholic chapel, a friary, and places of worship for Methodists, Presbyterians, and Independents. Sligo is the most important commercial town in Connaught, and has an increasing trade. The exports consist entirely of agricultural produce. The retail trade is extensive, articles of every kind in demand being supplied to a wide and populous district. There are some fine remains of a monastery built in 1322. The municipal borough is divided into 3 wards, and is governed by 6 aldermen and 18 councillors. Population of the town, 12,272. The municipal borough is coincident with the parliamentary borough, which returns one member: population, 14,318.

History and Antiquities.—This part of Connaught was made the scene of warfare between the descendants and family of Roderic O'Connor (the last monarch of Ireland), in their struggle for the principality of Connaught. Hugh O'Nial, chieftain of Tir-Owen, or Tyrone, was defeated near Ballysadere (A.D. 1200) in the attempt to reinstate Cathal Croobhderg, or Cathal of the Bloody Hand, who had been dethroned by his brother or kinsman Carrach, who was supported by the Anglo-Normans under De Burgo. Some of the Anglo-Norman settlers were engaged on the side of Cathal. In 1245 the castle of Sligo was built, and, having been destroyed by the natives, was restored about the beginning of the next century.

The relics of antiquity are numerous. There are many cromlechs and other supposed Druidical monuments; and several remarkable caverns, the origin and purpose of which are unknown. Raths, or hill forts, are numerous in all parts of the county; and at Drumcliff is a round tower; it is of small dimensions and coarse construction. The ecclesiastical and castellated ruins of a somewhat later date are also numerous: several of the monastic churches have been converted to parochial use.

SLING, an instrument with which stones or other missiles may be thrown to a great distance. In its simplest form the sling consists of a thong of leather, or a piece of cord or some woven fabric, both ends of which are held in the hand of the slinger. The stone or missile is placed in the fold or double of the thong, which is made wide at that part, and sometimes furnished with a slit or socket for the purpose of holding it; and the sling is then whirled round to gain an impetus. In the hands of an expert slinger, this instrument may be made to project missiles to a great distance, and with surprising accuracy.

The simplicity and portability of the sling, and the facility with which supplies of ammunition for it might be obtained, led to its extensive use among the ancients as a weapon of war, as well as for other purposes. Its common use among the Jews is intimated by several passages of Scripture. Several ancient paintings represent the use of the sling at an early period by the Egyptians. In the Greek and Roman armies the light troops consisted in great part of slingers. The sling is not mentioned by Herodotus; and it is an error to assign the use of it to the Persians.

The sling was long used, both as an offensive weapon and otherwise, in England. Strutt observes, that 'it is altogether uncertain whether the ancient inhabitants of Britain were acquainted with the use of the sling or not;' but that 'our Saxon ancestors certainly used it, and seem to have been skilful in its management.' Slingers formed a part also of the Anglo-Norman soldiery.

SLINGELANDT, PETER VAN, was born at Leyden in 1640, and became a pupil of Gerard Douw. He imitated very successfully the highly-finished style of his master, whom in this respect, though in no other, he frequently equalled. A few specimens of his paintings are to be seen in England, in Sir Robert Peel's and other collections. Slingelandt died in 1691.

SLOANE, SIR HANS, Bart., was born at Killileagh, in the county of Down, Ireland, April 16, 1660. About the age of 20 he went to London, and for four years devoted himself to the study of medicine and the collateral sciences. In 1683 he set out for Paris, and during his stay there attended the anatomical lectures of Duverney and those on botany by Tournefort. He passed a year at Montpellier, spending much of his time in collecting plants, and, after having travelled through Languedoc with the same purpose, returned to London in 1684. In 1685 he was elected a fellow of the Royal Society; and a fellow of the College of Physicians, in April, 1687. He was next appointed physician to the Duke of Albemarle, who was going out as governor of Jamaica, and he set sail Sept. 12, 1687, reaching Port Royal on Dec. 19, in the same year. The death of the duke soon after his arrival caused Sloane to return, and he arrived in England May 29, 1689.

The plants which he brought with him amounted to 800 species. Of these he gave his friend Mr. Courten whatever he wanted to complete his collection, and the remainder, with other objects of natural history, formed the nucleus of his museum.

He was appointed physician to Christ's Hospital in 1694, and held the office for thirty years.

In 1693 he was chosen secretary to the Royal Society; and in 1712 was elected one of the vice-presidents. The Academy of Sciences in Paris had conferred on him the title of a foreign associate in 1708. George I. created him a baronet in 1716, and appointed him physician-general to the forces; he was elected president of the College of Physicians in 1719, and held the office till 1735. In 1727 he was appointed physician to the king; and in the same year succeeded Newton in the president's chair of the Royal Society. He had purchased an estate at Chelsea in 1720, and retired thither in 1740. He died Jan. 11, 1753.

Sir Hans Sloane directed that at his death his museum should be offered to the nation for 20,000*l.*, a sum which he says, in a codicil to his will dated July 20, 1749, did not amount to a fourth part of its real value. This collection, in the purchase of which by government the British Museum originated, was not altogether accumulated by Sir H. Sloane, but had been greatly increased by the bequest, in 1702, of the museum of his friend Mr. Courten. At the time of his death, Sir H. Sloane's cabinet contained 200 volumes of dried plants, and 30,600 other specimens of objects of natural history, besides a library of 50,000 volumes and 3566 manuscripts. He contributed many papers to the 'Philosophical Transactions,' but his great work was the 'Natural History of Jamaica,' of which the first volume was published in 1707, and the second twenty years afterwards.

SLOANEA, a genus of fine trees of the natural family of *Tiliaceæ*, is divided into five sections, each of which may probably form a genus. The trees are not known to be applied to much use, with the exception of *S. dentata*, of which the wood is sometimes employed for making canoes of a single piece.

SLOBODE-UKRAINE, a province of southern Russia, which came into the possession of the Czars about the beginning of the 17th century. The tract of land of which we are speaking, being almost uninhabited in 1651, the emperor Alexei Michaelowich allowed the Cossacks of the western Ukraine to settle in it, and to enjoy the privileges guaranteed to them by Stephen Bathory, king of Poland. They then founded five large villages or 'Slobodâs;' and from this circumstance the name is derived. The name of the government however is now *Charkow*.

The province of Charkow is bounded N. by Kursk, E. by the country of the Don Cossacks, S. by Ekaterinoslaf, and W. by Poltâva. It contains 20,846 square miles, with a population of 1,467,400. The country is generally flat, and the soil very fertile, yielding about 4,000,000 quarters of corn of all kinds, one-fourth of which is exported. Flax, hemp, tobacco, hops, and potatoes are grown. Cattle are excellent, and bees very abundant. The industrial establishments include numerous distilleries, some tanyards, saltpetre works, and salgans, or tallow-melting houses. The forests in this government belong chiefly to the crown, and cover about 2000 square miles. Game is scarce, but the forests abound in wolves and foxes.

The population consists of Malo-Russians, Cossacks, Great Russians, German colonists, converted Calmucks, Jews, and Gipsies. Besides the military population of the Cossacks, there are five colonised regiments of cavalry. The chief occupation of the inhabitants is agriculture. The roads are bad, and the rivers not navigable. The Sievernoi-Donecz is the principal river, which, after receiving the Oskol in the neighbourhood of Izyum, falls into the Don. The other rivers are the Vorskla and the Psiol, both falling into the Dnieper, the former of which belongs to the southern districts, and the latter to the northern.

The capital, *Charkow*, is situated in 49° 59′ N. lat., 36° 26′ E. long., in the fork between the Charkowa and the Lopan, which throw their united waters into the Donecz. The town, which is ill built, with narrow winding streets of wooden houses, and contains 18,000 inhabitants, has a university, connected with which is a botanic garden, a collection of natural history, an observatory, and a library of 21,000 volumes. Charkow is the seat of a considerable commerce; four great fairs are held annually, one of which is chiefly for wool; at the others vast quantities of manufactured goods and other merchandise are sold. The manufactures of the town include articles of Cossack clothing, excellent carpets, felt cloaks, soap, candles, and leather. The other towns are—*Akhtyrka*, in the west of the government, near the Vorskla, which has 8 churches and 13,000 inhabitants: *Sumy*, in the north, on the right bank of the Psiol, famous for its traffic in horses, population 12,000: *Walki*, S.W. of Charkow, on the road to Poltawa, with 10,000 inhabitants: *Tchugujew*, S.E. of Charkow, on the Sievernoi-Donecz, which is the head quarters of a Cossack regiment, and has 10,000 inhabitants: *Bielopalje*, N.W. of Sumy, on a feeder of the Desna; population 10,000: *Lebedjan*, or *Lebedine*, S.S.W. of Sumy, with 9000 inhabitants: *Bogoduchow*, N.W. of Charkow, population 6800: *Miropolje*, population 6800: *Krasnokutzk*, W. of Charkow, on the right bank of the Merlo, with 5000 inhabitants: and *Smijew*, or *Zmiew*, on the Sievernoi-Donecz; population 5000. Many of these towns are fortified, and nearly all of them are built of wood, as are also most of the churches.

SLOE. [PRUNUS.]

SLOTH. [AÏ.]

SLOTH-BEAR. [BEAR.]

SLOW-WORM. [BLIND-WORM.]

SLUGS. [LIMAX.]

SLUICE, any kind of flood-gate or trap to retain water for a given time, or in a given direction. Sluices are extensively used in most hydraulic works, and vary much in their construction, according to the purposes for which they are required. In mill-streams they serve to keep back the water when the mill is at rest, and to regulate the supply when it is going. They also act as 'wasters,' to allow the surplus water of a reservoir to escape. For these purposes many self-acting sluices have been contrived, to avoid the

inconvenience and even danger which might arise from neglect, as well as to save the expense of a sluice-keeper. For canal-locks, it is necessary to make the large gates meet in an angle in the middle of the stream, in order that they may be able to resist the pressure of the water; and as this pressure would render it impossible to open them against any considerable head of water, small sluices are provided, either in the gates or in the masonry of the lock, by which the water may be let in or out at pleasure.

SLUR, in Music, a curved line (⁀) more or less extended, as may be required, drawn over two or many notes. If placed over two notes on the same line or space, it signifies that the second is not to be repeated, though to be held out its due time. When drawn over notes on different degrees, those notes are said to be *legato, i.e.* tied; and they are to be played in a smooth, blending manner.

SLUYS. [Zeeland.]

SMÄLAND. [Sweden.]

SMALL-POX (*Variola*). It is a subject of dispute whether this disease was known to the ancients, or whether it has originated at a comparatively recent date. The first author however who treats expressly of small-pox is Rhazes, an Arabian physician, but even he confounded it with measles, and these two diseases continued to be considered as modifications of the same disorder till the time of Sydenham. Small-Pox, when it occurs naturally, is preceded by the usual premonitory symptoms of eruptive fevers, such as rigors, pains in the back and loins, prostration of strength, loss of appetite, nausea, and sometimes vomiting, and, in young children, frequently convulsions. About forty-eight hours after the commencement of these symptoms an eruption of small, hard, red-coloured pimples makes its appearance about the face and neck, and gradually extends downwards over the trunk and extremities. The primary fever, as it is called, now lessens; but the pimples increase in size, and become converted into whey-coloured pustules with a depression in their centre. On the eighth day they are at their height, and on the eleventh the matter oozes from them and concretes into crusts, which fall off about the fourteenth day, leaving the skin of a brownish-red colour, and studded with slight depressions or pits. As the eruption travels from above downwards, the parts of the body successively attacked by it become affected with swelling, the mouth waters, and the voice is hoarse; when the incrustation has taken place, these symptoms subside, but a secondary fever commences, which is sometimes more severe than that which preceded the outbreak of the eruption. Small-Pox, according to its severity, is distinguished by authors into two varieties, the distinct and the confluent, *Variola discreta* and *Variola confluens*. Small-Pox is frequently epidemic, especially in the spring, and, like all other epidemics, those who are first attacked by it suffer the most severely: it is observed also to be greatly influenced by certain conditions of the atmosphere.

Small-Pox can be communicated by inoculation with the matter of its pustules; and the resulting disease being rendered milder by this operation, it was formerly much practised to guard the individual against a spontaneous attack. Since however the introduction of vaccination by Dr. Jenner, the practice has been properly abandoned.

The history of the different epidemics of small-pox shows the mortality to be one in four of those attacked who had not been vaccinated; whilst of those who had undergone vaccination the proportion was not one in 450.

No peculiar plan of treatment is required for small-pox; it is that of ordinary fever: cleanliness, free ventilation, an attention to the strength of the patient, and a watchfulness against accidental complications, are the principal points to be kept in view.

SMALT is a glass coloured of a fine blue, by means of oxide of cobalt. [Cobalt.] When reduced to an impalpable powder it is employed to give a blue tint to writing-paper and linen.

SMART, CHRISTOPHER, was born at Shepburne in Kent, April 11, 1722. He was educated at Durham and Maidstone schools, and at Pembroke Hall, Cambridge, of which he was elected a fellow, July 3, 1745. He gained the Seatonian prize for five successive years. In 1753 he quitted Cambridge, and afterwards resided in London, endeavouring to make a livelihood by trifling literary undertakings. He became engaged in an altercation with Sir John Hill, who criticised his poems, and Smart in revenge published a satire called the 'Hilliad.'

In 1754 he became deranged, and continued in this condition, with intervals of sanity more or less lasting, till his death, May 18, 1770, in the rules of the King's Bench, where he had been confined in his latter years. Smart translated the Psalms, Phædrus, and Horace into prose; and in 1752 published a collection of poems, which are now forgotten. He seems to have been an improvident man, not destitute of good qualities, such as gained the friendship of Garrick and Johnson, the latter of whom has written an account of him. His poems were printed in 1791.

SMEATHMA'NNIA, a small but beautiful genus of plants belonging to the natural order *Passifloraceæ*. Three species are recorded, *S. pubescens*, *S. lævigata*, and *S. media*.

SMEATON, JOHN, was born, according to most authorities, May 28, 1724, at Austhorpe, near Leeds. He was brought up with a view to the legal profession, but mechanical pursuits engrossed his attention from a very early age.

About 1742 Smeaton came to London, and, abandoning the law after a short trial, is next found, about 1750, pursuing the business of a mathematical-instrument maker, in Great Turnstile, Holborn. In 1751 he constructed a machine for measuring a ship's way at sea; and in 1752 and 1753 was engaged in a course of experiments 'concerning the natural powers of water and wind to turn mills and other machines depending on circular motion.' The results of these experiments were published in 1759, and obtained for him the Copley gold medal of the Royal Society in that year. Smeaton had in 1753 been made a member of the Royal Society; and had contri-

buted to the 'Transactions' even before that date. In 1754 he visited Holland and the Netherlands.

In 1766 Smeaton commenced the great work which, more than any other, may be looked upon as a monument of his skill—the Eddystone lighthouse. [PLYMOUTH.]

In 1764 Smeaton was the successful candidate for the office of receiver of the Derwentwater estate, the funds of which were, after its forfeiture in 1715, appropriated to Greenwich Hospital. While holding this office he greatly improved the estate, the mines and mills of which required the superintendence of such a man to make them of their full value. Increasing business induced him, in 1777, to relinquish this engagement.

Of the many useful works executed by Smeaton, Ramsgate harbour perhaps holds, next the Eddystone lighthouse, the most prominent place. [KENT.] This work was commenced in 1749, and was placed under his superintendence in 1774; but was completed by the two Rennies, father and son. Smeaton laid out the line of the great canal connecting the western and eastern shores of Scotland, from the Forth to the Clyde, and superintended the execution of great part of it. The Spurn lighthouse at the mouth of the Humber, some important bridges in Scotland, and many other works of like character were executed by him.

About 1783 Smeaton's declining health rendered it necessary for him to avoid entering upon many new undertakings. He then devoted much attention to the publication of an account of the Eddystone lighthouse, which was to have been followed by a 'Treatise on Mills,' and other works embodying his valuable experience as an engineer. He died Oct. 28, 1792.

Smeaton's numerous professional reports were published after his death by a society of his friends engaged in kindred pursuits, in three quarto volumes, to which a fourth was subsequently added, consisting of his miscellaneous papers communicated to the Royal Society, &c.

Besides the works already mentioned, Smeaton introduced many improvements in mathematical apparatus, and had an ardent love for science. He was particularly attached to astronomy, and had an observatory at Austhorpe, where, even during the most active part of his career, he occasionally resided.

SMEDLEY, EDWARD, Reverend, was born about the year 1789, and was the son of the Rev. Edward Smedley, one of the ushers of Westminster School. He was admitted a king's scholar at Westminster in 1800; and thence he removed in due course to Trinity College, Cambridge. He took his degree of B.A. in 1809, and, having obtained one of the Member's Classical Prizes in 1810, and again in 1811, he was elected a fellow of Sidney College. He obtained no fewer than four of the Seatonian Prizes for English Poems; and in 1829 he was collated by Bishop Tomline to a prebend in the cathedral church of Lincoln, the value of which however was only 14*l.* a year. He was the author of a 'History of the Reformed Religion in France,' in 5 vols. 12mo., and of one volume of a 'History of France,' published under the superintendence of the Society for the Diffusion of Useful Knowledge. At the time of his death he was editor of the 'Encyclopædia Metropolitana;' and he contributed several articles on French biography and English and Roman literature to the earlier volumes of the 'Penny Cyclopædia.' His death took place at Dulwich, June 29, 1836.

SMELL. The essential part of the organ of smell consists of the expansion of the olfactory nerves, the first or most anterior of the nerves from the brain, whose minutest branches are distributed just beneath the mucous membrane of part of the nose.

The human organ of smell is less developed than that of other mammalia, in most of which the turbinated bones, and all the parts to which the olfactory nerves are distributed, are much larger and more complicated in their form.

All that is necessary for the perception of an odour is that the scented particles (without undergoing any such changes as light does in arriving at the retina, or sound on its way to the auditory nerve) should come in contact with the surface under which the olfactory nerves lie, with the force of rather more than an ordinary inspiration. If the medium containing the odour be at rest, or be only gently forced against the membrane, no impression is produced.

In different animals the sense of smell is adapted chiefly to that class of substances on which they feed. The carnivora, for example, have an acute sense of the odour of animal substances, but, so far as we can discern, none for that of vegetables; and, on the other hand, herbivora are as clear in their perception of the latter, and as nearly insensible to the former. Man, as his food is mixed, so also is his sense of smell adapted to both classes of substances, though for each less acute than that of the animals that feed exclusively on the one or the other. In the choice of food, which is the main object of the sense of smell, man generally, though almost unconsciously, and animals always, exercise the precaution of smelling, and they instinctively form a judgment according to the impression received. In eating also, much of that which is commonly attributed to the sense of taste depends on the odour of the food carried from the mouth to the nose. In eating cinnamon, for example, or any similar aromatic substance, if we close the nostrils, we perceive no flavour, and, except the stinging of the tongue, might imagine ourselves eating a tasteless wood. And, in like manner, we often mistake for those of odour the impressions made by substances on the nerves of common sensation with which the lining membrane of the nose is abundantly supplied; for example, in smelling ammonia, vinegar, and other acrid substances, the impression which we regard as their odour is compounded of that and of the irritation of the nerves of common sensation; and the nose of an animal whose olfactory nerves are destroyed is hardly less sensible to this latter irritation than that of one in which the nerves are entire. Facts of this kind have led to the error of supposing that the olfactory are not the only nerves of smell; they only prove that the sense of

smell has a more limited range than is commonly supposed. The same substances, ammonia and the like, which irritate the common sensitive nerves of the nose, act in the same manner on the eye or any equally delicate part; but in the nose alone is this irritation accompanied by any peculiar sensation of odour by which one such substance can be distinguished from another. This perception of odour, independently of iritation, is the proper function of the olfactory nerves, which are thus strictly nerves of peculiar sensation, of the same class with the optic, auditory, and gustatory.

SMELTING. [IRON MANUFACTURE.]

SMILA'CEÆ, a small natural order of plants belonging to Lindley's Retose group of Monocotyledons. Smilax is found in most parts of the world, especially in Asia and America.

SMILACIN, *Salseparin*, a peculiar principle found in Sarsaparilla (*Smilax*). It exists in the form of colourless needles, is inodorous, very soluble in water and in alcohol, when boiling, but less so when cold. It dissolves in æther and volatile oils. Smilacin dissolves in weak acids and alkaline solutions, and separates from them unaltered when they are neutralised. Sulphuric acid colours it first deep red, then violet, and afterwards yellow. Water precipitates it unaltered. Its formula is $C^{15} H^{13} O^5$.

SMILAX, a genus of plants which gives its name to the natural family of *Smilaceæ*. The species form evergreen climbing shrubs, of which a few are found in temperate, but the majority in warm and tropical regions of both hemispheres, extending south to Australia, and north to Japan, North America, and the south of Europe.

Though the original species (*S. aspera*) of this genus is an inhabitant of the south of Europe, those now most celebrated for yielding the different kinds of *Sarza* or *Sarsaparilla* are natives of South America. But *S. aspera* still continues to be employed for medicinal purposes in the south of Europe, where it is called *Sarsaparilla Italica*, but there is no truth in the statement of its being the plant yielding Indian Sarsaparilla, which is *Hemidesmus Indicus*. Another celebrated species is the *Smilax China*, which has a tuberous root abounding in fecula, and therefore probably useful as a demulcent, though the Chinese esteem it invigorating, and ascribe to it other virtues. Though the genus *Smilax* contains about one hundred species, few others require notice except those yielding the medicinal Sarsaparilla.

Medical Properties of Sarsaparilla.—Though, according to Dr. Hancock, but one species of this rather extensive genus yields the genuine sarsaparilla, it is quite certain that the roots of many are collected, and pass under that name in commerce. The species which, according to him, furnishes the true root is a native of Guiana, growing on the elevated lands of the Rio Juniquen at Unturana and Caraburi. Several sorts are known in the shops, the principal of which are—Jamaica or Red Sarsaparilla, Para or Brazilian Sarza, Honduras Sarza, Vera Cruz Sarza, and Lima Sarza.

The virtues of Sarsaparilla are the subject of much diversity of opinion; many practical men deeming it very useful, while others consider it nearly worthless. It is chiefly used in chronic, syphilitic, rheumatic, gouty, and cutaneous diseases. Its most obvious action is diaphoretic, but if the patient be kept cool, diuretic.

SMIRKE, ROBERT, R.A., was born in 1751. Originally a painter of coach-panels, he was one of the most distinguished of the English *genre* painters, and had indeed no great rival before the time of Wilkie. His subjects are various, but his favourite author was Cervantes; a great proportion of his pictures are from Don Quixote. He was elected an Academician in 1792, the year that Reynolds died, and he gave as his presentation picture Don Quixote and Sancho. Smirke designed much for booksellers, and for annuals and such works, and he was one of the contributors to Boydell's Shakspere. He painted several pictures from Shakspere, as Catherine and Petruchio, Juliet and her Nurse, Prince Henry and Falstaff, The Seven Ages, and others. The last time he exhibited was in 1813: the picture was styled Infancy. In other classes, the following pictures are among his best works:—Infant Bacchus; Psyche; the Plague of Serpents; the Angel justifying Providence, from Parnell's 'Hermit;' the Gipsy; the Fortune-Tellers, &c. &c. Smirke died in London, Jan. 5, 1845, having been an Academician fifty-three years.

SMITH, SIR THOMAS, was the eldest of the three sons of John Smith, of Saffron-Walden. Thomas was born at Saffron-Walden on the 28th of March, 1514, or 1515. In 1526 he was entered of Queen's College, Cambridge, of which he became a fellow in 1531. He applied himself diligently to the study of the Greek language. In 1535 he was appointed to read the public Greek lecture; and it was while holding this office that, in conjunction with his friend Cheke, he introduced the improved mode of pronouncing the Greek letters, of which he has given an account and defence in his tract entitled 'De Rectâ et Emendatâ Linguæ Græcæ Pronuntiatione,' first printed in 4to., at Paris, in 1568.

In 1536 Smith was chosen public orator. But in 1539 he left England, and remained abroad for two or three years, during which time he visited France and Italy, and took his degree of doctor of the civil law at Padua. After his return home, having taken the same degree at Cambridge in 1542, he was appointed king's professor of law in that University. He is stated to have taken at least deacon's orders, and to have held both the rectory of Leverington in Cambridgeshire and the deanery of Carlisle. His father had been long attached to the new doctrines in religion, and he had himself been brought up in the reformed faith from his childhood.

On the accession of Edward VI., he was taken into the family of the lord-protector Somerset; and was appointed to the two lucrative places of Provost of Eton and Steward of the Stannaries. In 1548 he was made secretary of state and knighted; and in the same year he was sent to Brussels on an embassy to the Emperor Charles V.

When the crown passed to Mary, Sir Thomas Smith was deprived of all his employments and preferments; but he was not further molested, and was allowed a pension of 100*l.* a year. On the accession of Elizabeth, he was immediately restored to his deanery. In 1559 he was sent to France as one of the commissioners by whom a peace was concluded between the two countries; and being again sent thither in 1562, he continued to reside abroad till 1566. In 1571 he was admitted of the privy council, and soon after appointed assistant secretary of state under Burleigh. In 1572 he once more went over in a diplomatic capacity to France. In June that same year, on Burleigh's promotion to the place of lord treasurer, Smith succeeded him as secretary of state; and this office he held till his death, Aug. 12, 1577. He died possessed of considerable landed property, which, as he left no issue, though he was twice married, descended to the family of one of his younger brothers. A natural son whom he had was killed in Ireland in 1573.

Sir Thomas Smith is the author of a tract, entitled 'De Rectâ et Emendatâ Linguæ Anglicæ Scriptione,' 1568. But his most remarkable work is that entitled 'The English Commonwealth,' in three books, first published in 1584, and several times reprinted since; and in a Latin translation executed by himself, forming one of the small volumes of the collection of the 'Respublicæ.'

SMITH, JOHN. [VIRGINIA.]

SMITH, ROBERT, D.D., an English mathematician, who was born in the year 1689: the place of his birth and the manner in which he was educated are not known. He was a cousin by his mother's side of the celebrated Roger Cotes. Mr. Cotes, who was Plumian professor of astronomy at Cambridge, dying in 1716, Mr. Smith, then M.A., was immediately afterwards appointed to succeed him: in 1723 he was made LL.D.; and in 1742, on the death of Dr. Bentley, he was appointed master of Trinity College. In 1722 he published, under the title of 'Harmonia Mensurarum,' and with a valuable commentary, several tracts on philosophical subjects which had been written by his relative and friend; and in 1738 he brought out, in two vols. 4to., his great work, entitled 'A Complete System of Optics.'

Dr. Smith undertook to correct and publish Cotes's 'Lectures on Hydrostatics and Pneumatics;' and this work came out in the year 1737. In the following year he published in one volume, 8vo., a treatise entitled 'Harmonics, or the Philosophy of Musical Sounds;' and of this work a second edition appeared in 1758. He died at Cambridge in 1768, and in the seventy-ninth year of his age, having been a liberal benefactor both to the University and to Trinity College; and having bequeathed two annual prizes, each of 25*l.*, for students who, being bachelors of arts, should have made the greatest progress in mathematics and natural philosophy. The two bachelors who gain these prizes are designated by the name of Smith's Prizemen.

SMITH, ADAM, was born at Kirkaldy, June 5, 1723. He was sent to the grammar-school of his native town, and from 1737 to 1740 he pursued his studies at the University of Glasgow. Being designed for the Church of England, he left Glasgow, and proceeded as an exhibitioner on Snell's foundation to Balliol College, Oxford, where he spent seven years. Mathematics and natural philosophy, with ancient and modern languages, were his favourite studies at this university. Having abandoned the idea of taking orders, he returned to Scotland; and in 1748 went to reside at Edinburgh, where, for the next three years, he read lectures on rhetoric and belles-lettres. In 1751 he was elected professor of logic in the University of Glasgow; and in the following year was appointed to the chair of moral philosophy, which he filled for the next thirteen years. The third division of his lectures included various subjects, which he subsequently so ably treated in the 'Wealth of Nations.' During his residence at Glasgow, he published his 'Theory of Moral Sentiments:' the first edition appeared in 1759, and the sixth, which contains considerable additions, shortly before the author's death. To the second edition of the above work was prefixed a dissertation on the origin of languages, which was afterwards published separately. In 1763 Mr. Smith resigned his professorship, in consequence of an invitation to accompany the Duke of Buccleugh on his travels. He left London with his noble pupil Jan. 1764, visited various parts of France and Switzerland, and returned to England after an absence of three years. Smith soon after proceeded to Kirkaldy, where, with the exception of occasional visits to Edinburgh and London, he resided until 1766, engaged in his great work, the 'Wealth of Nations,' which appeared early in 1776. To the third edition (1784) the author made several additions; but the fourth edition (1789) contained no alterations of any kind. The two following years after the first appearance of the work were spent in London. In 1788 Mr. Smith was appointed one of the commissioners of customs for Scotland, on which he removed to Edinburgh, where he spent the remaining thirteen years of his life. In 1763 Adam Smith had received the degree of LL.D. from the University of Glasgow, and in 1787 he was elected its rector. He died in July, 1790. He was never married.

The 'Wealth of Nations,' or, to give the title correctly, the 'Inquiry into the Nature and Causes of the Wealth of Nations,' is the work on which the fame of Adam Smith will permanently rest. It was a most useful work at the time: it overthrew the errors of the mercantile theory, that money was wealth; those of the agricultural theory, that land was the only source of wealth; and established the principle that the true source of wealth was labour.

SMITH, JOHN RAPHAEL, son of a respectable landscape-painter, who, from the place of his residence, is commonly known as Smith of Derby, was born about the middle of the last century. He was apprenticed to a linendraper, but forsook the counter, and became eminent as a mezzotinto engraver and also as a painter. It appears that he was in full practice as an artist in

London about 1778. He executed many beautiful engravings from pictures by Sir Joshua Reynolds, and several from his own. Among the latter are portraits of Charles James Fox and Earl Stanhope. Latterly Smith devoted himself chiefly to the production of crayon portraits. He died in 1811 or 1812.

SMITH, ANKER, was born in London in 1759, educated in the Merchant Taylors' School, and articled, in 1777, to his uncle, Mr. John Hoole, a solicitor; but displaying extraordinary talent as a draughtsman, Smith was transferred to an engraver named Taylor in 1779, whom he quitted in 1782. He then became an assistant to James Heath, in whose name he executed many works, among others, the Apotheosis of Handel. Alderman Boydell afterwards commissioned him to engrave Northcote's picture of the Death of Wat Tyler. For this engraving he was, in 1797, elected an associate of the Royal Academy.

The engravings of Anker Smith are much esteemed for their beautiful execution and correct drawing. He died in June, 1819. Of his sons, the second, named Frederick William Smith, became a pupil of Chantrey, and gave promise of eminence in the art of sculpture, but died in 1835, at the age of thirty-eight years. Mr. Smith had several sisters, one of whom was mother of Sir W. C. Ross, miniature-painter to her present majesty.

SMITH, SIR JAMES EDWARD, was born at Norwich Dec. 2, 1759. He was intended for some mercantile calling, but from his love of science was induced to study medicine, for which purpose he proceeded to Edinburgh in 1781, and obtained in 1782 Dr. Hope's gold medal for the best botanical collection. After his arrival in London, he purchased the whole of the collection of books, manuscripts, and natural history of Linnæus, which arrived here in twenty-six cases, in 1784, and cost 1088*l.* 5*s.* On the death of Sir James this collection was purchased by the Linnæan Society, and now forms a part of their valuable possessions. Two years afterwards, Smith made a tour through Holland, France, Italy, and Switzerland, of which he published an account. He obtained his medical degree at Leyden. In the year 1788, with the assistance of Sir Joseph Banks, Dr. Goodenough (Bishop of Carlisle), and some others, the Linnæan Society was founded, and Smith was its first president. He continued to reside in London until 1796, when he removed to Norwich, but paid a yearly visit of two months to London, when he gave a course of lectures on botany at the Royal Institution. On July 28, 1814, Dr. Smith was knighted by the Prince Regent, when he presented a copy of the 'Transactions' of the Linnæan Society. Sir James died March 17, 1828.

A full list of his works is given in the 'Memoir of his Life and Correspondence,' published by his widow. These are numerous, but those by which he will be principally known and remembered are, 'English Botany,' in thirty-six volumes, with 2592 coloured figures by Mr. Sowerby; 'The Latin Flora Britannica,' three volumes, and especially 'The English Flora, in four volumes; also 'Flora Græca,' from Dr. Sibthorp's materials, and the 'Prodromus Floræ Græcæ.'

SMITH, JOHN THOMAS, the son of Nathaniel Smith, a sculptor, and afterwards a printseller in Great May's Buildings, St. Martin's Lane, was born June 23, 1766. His mother dying in 1779, he was invited to the studio of Nollekens, to whom his father was then chief assistant. After enjoying this privilege for three years, during which time he had much practice in drawing, he became a student at the Royal Academy, and subsequently a pupil of Sherwin the engraver. For some years afterwards Smith was chiefly engaged as a drawing-master.

He married at the age of twenty-two, and soon afterwards (1791) commenced the publication, in numbers, of his first work, the 'Antiquities of London and its Environs,' which was completed in 1800; the whole series consisting of ninety-six plates of a quarto size. His next work for the illustration of the early architecture of the metropolis was his 'Antiquities of Westminster,' comprising the old Palace, St. Stephen's Chapel, &c., and containing engravings of 246 topographical objects, of which, at the time of its publication (1807), 122 were no longer in existence. The plates were accompanied by descriptions, a great portion of which were written by J. Sidney Hawkins, F.S.A. A fire at Bensley's printing-office destroyed 400 copies of this work, and 5600 prints, occasioning a loss to Mr. Smith which he estimated at 3000*l.* In 1809 appeared a second volume, but without any description, or even a list of subjects. A description of the whole work however will be found in Upcott's 'Bibliographical Account of the Principal Works relating to English Topography.'

In 1810 Smith commenced the publication of the 'Ancient Topography of London,' which was completed in 1815. This, which is considered Smith's best work, contains 32 plates, boldly etched, and accompanied by descriptions of the buildings represented. In 1816 Mr. Smith received the appointment of keeper of the prints in the British Museum; and in the next year published his 'Vagabondiana, or Anecdotes of Mendicant Wanderers through the Streets of London,' illustrated with about thirty portraits, and with an introduction by Mr. Douce.

The last literary production of Mr. Smith was the amusing but not very honourable or trustworthy book entitled 'Nollekens and his Times,' which appeared in 1828, and soon ran through three editions. Smith died March 8, 1833. He left in manuscript materials for a history of his own life and times, which has not been published; and had also collected much matter towards an account of the parish of St. Paul, Covent Garden, and for a work which he intended to call 'Walks through London.'

SMITH, SYDNEY, was born in 1768, at the village of Woodford, in Essex. He was educated at the collegiate school of Winchester, and was elected in 1780 a scholar of New College, Oxford, of which college he was elected a fellow in 1790.

In 1796 he took the degree of M.A., and soon afterwards obtained the curacy of Nether-Avon, near Amesbury, in Wiltshire, where he remained about two years, and then accepted the office of tutor to the son of Mr. Hicks Beach, M.P. for Cirencester. Sydney Smith went with his pupil to Edinburgh, where he remained about five years. Among the persons with whom he formed an acquaintance in that city were Henry Brougham, now Lord Brougham, the late Lord Jeffrey, and others of similar opinions in politics. This acquaintance led to the establishment of the 'Edinburgh Review,' of the first number of which (published in Oct. 1802) Sydney Smith was the editor. In 1803 he removed to London, where he became preacher at the chapel of the Foundling Hospital, and at other places. He also delivered lectures on polite literature at the Royal Institution in Albemarle Street, which have been published this year (1850) for the first time; and he was a regular contributor to the 'Edinburgh Review.'

Lord Erskine, when Lord Chancellor, gave him, in 1806, the rectory of Foston, in Yorkshire. In 1829 he was presented to the rectory of Combe-Florey, in Somersetshire, by Lord Lyndhurst, and in 1831 he was appointed by Earl Grey one of the canons residentiary of St. Paul's Cathedral. Except a few years when he resided at his rectory of Foston, and during which he published anonymously, in 1808, 'Letters on the Subject of the Catholics to my Brother Abraham who lives in the Country, by Peter Plymley,' his place of residence was London, where he associated with literary men and politicians of Whig principles. He was distinguished for his conversational powers, and was a frequent 'diner out.' He died at his house in Green Street, Mayfair, London, Feb. 21, 1845.

Sydney Smith published 'Six Sermons,' Edinb., 12mo., 1800; 'Sermons,' 2 vols. 8vo., Lond., 1809; several occasional sermons and political pamphlets; and contributions to the 'Edinburgh Review.' In 1839 he published what he himself probably regarded as the best of his literary compositions, 'The Works of the Rev. Sydney Smith,' 3 vols. 8vo., with a preface by the author and a portrait.

Sydney Smith is a very effective writer; he has considerable argumentative power, united with wit, humour, and poignant satire. His style is clear and forcible, without any apparent aim at elaboration or polish.

SMITH, WILLIAM, was born March 23, 1769, at Churchill, in Oxfordshire. He has been called the 'father of English geology,' a science which his employment as surveyor of collieries and mines in Somersetshire, and as engineer to the Somerset Coal Canal, gave him ample opportunities of investigating.

With his ideas upon the subject clearly established, Mr. Smith, in 1794, was enabled, by one long journey through great part of England and Wales, to commence a 'Geological Map of England and Wales,' and a 'Table of Superposition of the Strata.' This table was drawn up in 1799; a map on a small scale was coloured in 1801; and the author promised in that year a valuable volume to accompany documents so new and important. It would be painful to speak of the discouragements and difficulties which Mr. Smith had to overcome before, in 1815, on a large and handsome scale, appeared the 'Delineation of the Strata of England and Wales,' with an interesting memoir. To his favourite science all the profits of a successful profession were devoted; but not even when suffering from the consequences was he ever known to regret the sacrifices he had made.

After giving to the world 21 geologically-coloured maps of English counties, many valuable sections, and two unfinished volumes on Organic Remains, Mr. Smith was for many years lost to science till drawn from his retirement by the Geological Society of London, which, in 1831, awarded to him the first medal placed at their disposal by the bequest of Wollaston.

In 1835 he received the degree of LL.D. in Trinity College, Dublin, and during a few years he enjoyed a pension of 100*l*. He died Aug. 28, 1839.

SMI'THIA, a genus of plants of the natural family of *Leguminosæ*. The species are found in warm parts of the world as in Australia and the plains of India, in the rainy season.

SMOKE, the vapour arising from substances in a state of combustion. In its more extended sense the word smoke is applied to all the volatile products of combustion, which consist of gaseous exhalations charged with minute portions of carbonaceous matter, or soot.

Cure of Smoky Chimneys.—The action of an ordinary chimney in conveying the smoke from a fire situated at its lower extremity is very simple. The air in the chimney, being rarefied by the heat, becomes lighter in proportion to its bulk than the surrounding atmosphere, and therefore rises, its place being supplied by fresh air forced in at the lower end by the pressure of the comparatively heavy cold air outside the chimney. A constant rising current is thus created, the force of which is sufficient to carry up with it any light bodies, such as the particles of soot which escape from the fire. The higher the chimney, and the warmer the air within it, the better will the smoke ascend. Franklin enumerated nine causes for the smoking (as it is termed) of ordinary chimneys:—the want of a free supply of air to the bottom of the chimney; the opening at the lower end of the chimney being too large; the chimney being too short; different chimneys in the same house having different degrees of draught, whereby one overpowers another; the situation of the house near a higher house or a hill; the lower level of a chimney than those which surround it; the injudicious arrangement of the doors of a room; the descent of smoke in a chimney out of use; and the occasional effects of high or contrary winds. He treated all these causes in succession, and proposed such measures as he thought likely to meet the exigencies of each. The reader will find them in Franklin's 'Observations on the Causes and Cure of Smoky Chimneys.'

Consumption of Smoke.—The nuisance occasioned by the smoke of coal-fires has formed a subject of complaint from the earliest times in which mineral fuel was extensively used; and the great increase of steam-engine and other furnaces, consequent on the extension of manufactures, has afforded, of late years, additional ground for attempts to abate the nuisance. Such attempts are important, not only for the purification of the air, but also for the economy of fuel; since the matter which gives smoke objectionable density and colour is unconsumed fuel in a finely-divided state. It appears therefore that if a supply of air could be thrown into a fire in such a way as to occasion the combustion of the carbonaceous matter, the result would be that a greater amount of heat would be obtained from a given quantity of fuel, at the same time that the nuisance of smoke would be abated.

The quantity of smoke emitted from furnace-chimneys varies much with the state of the fire; being greatest when a mass of fresh fuel is thrown on, and least when the fire has burned clear, or the fuel is fully ignited. Attention to this circumstance, on the part of the stoker, will greatly diminish the nuisance; because if he throw on the fresh fuel in a thin layer, it will the sooner become perfectly ignited; and, by laying it in the fore part of the furnace, the dense smoke arising from it has to pass over that part of the fire which is in a state of more perfect combustion, and is thereby in a great measure consumed. Many of the contrivances introduced or suggested as smoke-consuming furnaces act on these principles; arrangements being adopted to insure the right feeding of the fire without much attention on the part of the firemen. The first important attempt made in this country for the combustion of smoke was that of Watt, who obtained a patent in 1785 for a method of constructing furnaces in such a way as to cause 'the smoke or flame of the fresh fuel, in its way to the flues, or chimney, to pass, together with a current of fresh air, through, over, or among fuel which has already ceased to smoke, or which is converted into coke, charcoal, or cinders, and which is intensely hot; by which means the smoke and grosser parts of the flame, by coming into close contact with, or by being brought near unto, the said intensely hot fuel, and by being mixed with the current of fresh or unburned air, are consumed or converted into heat, or into pure flame, free from smoke.' Since that time innumerable plans have been brought forward for introducing the necessary supply of air to the furnace; but while many of them accomplish the purification of the smoke as completely as could be desired, they are generally found either to increase the consumption of fuel, or to weaken the draught of the furnace. A singular plan has been introduced by Mr. Iveson, of injecting steam into the furnace; the steam being thrown into the fire in several minute jets, from a fan-shaped distributor in the fore part of the furnace. The steam not only destroys the smoke, but also greatly increases the intensity of the fire; so much so, indeed, as to sanction the supposition that the steam is decomposed, and that its component gases are consumed. One drawback to the scheme is the great consumption of steam. A patent was obtained in 1838, by Mr. Chappé, for the use of a stream or shower of hot water thrown into the furnace in the same way.

Besides the numerous plans for the combustion of smoke, various methods have been tried on a limited scale for conducting it to a distance from the buildings in which it is formed, by means of subterraneous channels; and for condensing it by means of a shower of water, so that the sooty matter might be conveyed away by the sewers.

SMOKE-BALLS. [Light-Balls.]

SMOKE-JACK, an apparatus believed to be of German origin, and as old as the 14th century, by which the rising current in a chimney, acting upon the inclined vanes of a wheel fixed in the funnel, gives motion, through a train of wheels, to any matter which is hung before the fire to roast. This contrivance is now almost superseded by jacks impelled by the descent of a weight or the uncoiling of a spring.

SMOLENSK, a province of the Russian Empire, is bounded N.W. by Pskow, N.E. by Twer, E. by Moscow, S.E. by Kaluga and Orel, S. by Czernigow, S.W. by Mohilew, and W. by Witepsk. The area is 21,571 square miles, and the population in 1846 was 1,170,600.

The surface presents an undulating level, being in fact an elevated table-land into which the Alauman Hills extend from the N.W., containing the sources of several considerable rivers. The principal rivers are: the Dnieper, the Obscha, the Mischa, the Kaspla, which run in a westerly direction to the Düna; the Ugra, which flows eastward to the Oka; the Gshat, and the Wasuga, both of which run into the Volga. There are many morasses and small lakes. The soil is clay mixed with sand and black mould, and very fertile. As the country lies high, the climate is colder than that of other provinces in the same latitude. The frost in winter is very severe, and the ice does not break up till April; on the other hand, the heat of the summer months is very great, vegetation luxuriant, the weather not changeable, and the air healthy.

The agricultural products are corn (especially rye), hemp, flax, tobacco, hops, potherbs, and some fruit; but the wealth of the country consists chiefly of the immense forests that supply fine ship-timber, which is sent to Riga. These forests abound in game of all kinds; elks, deer, wild boars, wolves, bears, and lynxes are found in them, and prodigious quantities of wild birds. Much attention is paid to the breed of horses. Oxen are used in agriculture as well as horses; and great numbers are fattened for exportation. Swine are very numerous. The country people have great numbers of bees. The minerals are copper, salt, and bog-iron. There are numerous saw-mills, brandy distilleries, tanneries, soap and candle manufactories, and some glass works; superior carpets are made in the city of Smolensk.

The exports, consisting chiefly of the products named or indicated above, are conveyed by land to Riga, Wilna, and Moscow; the timber is floated down the rivers which fall into the Düna, the

Oka, and the Volga. The imports are colonial produce, wines, manufactured goods, and miscellaneous articles.

The province is divided into 12 circles.

Smolensk, the chief town, is in 54° 47′ N. lat, 32° E. long., on the Dnieper, which is here crossed by a wooden bridge. It is an important military position, and considered to be the key to the interior of Russia. The town is defended by a strong citadel and surrounded by a wall 30 feet high, 15 thick, and nearly 2 miles in circuit. In 1812 the first serious conflict between the French and the Russians took place on the 16th and 17th of August, under the walls of Smolensk, when the town was bombarded and half of it burnt before it surrendered to the French. On their retreat the French in November following blew up part of the works. Smolensk, though not a handsome city, is now much superior to what it was before 1812, when it was almost entirely built of wood. The part rebuilt since that time is more regular; the houses generally of stone, and many of them handsome. The public buildings are numerous; there are 16 Greek churches, one Roman Catholic and one Lutheran chapel, a gymnasium, a seminary for priests, a military school, &c. The manufactures are linen, carpets, leather, silk, hats, and soap.

Wiasma, about 110 miles N. by E. from Smolensk, on the road to Moscow, is a considerable walled town, with 12,000 inhabitants. It is situated on a river of the same name. It looks much larger than it is in consequence of its enclosing much vacant space. *Porestschje* on the Kaspla, which is here navigable, is a town with 6000 inhabitants, 50 miles N. by W. from Smolensk. It has a considerable transit trade. *Dorogobusch*, on the Dnieper, is a well-built town, with 4000 inhabitants.

SMOLLETT, TOBIAS, was born at Cardross, in Dumbartonshire, in 1721, of good family, his grandfather being Sir James Smollett of Bonhill, upon whom he was left dependent. He was sent to school at Dumbarton, where his tendency to ridicule was manifested very early, and he wrote satirical verses on his schoolfellows. He left Dumbarton for Glasgow, where he was apprenticed to Mr. Gordon, surgeon, who is supposed to have been the original of Potion, in 'Roderick Random.'

His medical studies were but indifferently prosecuted: the more attractive pursuit of literature and history diverted his attention. Before completing his eighteenth year he finished a tragedy called 'The Regicide,' which he brought with him to London, in the hope of having it brought on the stage, but it was rejected by the managers, and he then caused it to be printed, with little or no advantage to his fame or fortune.

In 1741 Smollett was appointed surgeon's mate on board a ship of the line, and he sailed on the expedition to Carthagena. He describes this expedition in 'Roderick Random,' and also in the 'Compendium of Voyages and Travels' which he published in 1756. He quitted the service whilst in the West Indies, and resided for some time in Jamaica; in what capacity is not known.

'Advice,' a satire, was the medium of his first appearance before the London public on his return in 1746. He wrote also an opera for Covent-garden called 'Alceste.' But his ungovernable temper was perpetually provoked at the delays and hindrances of a theatre, and a quarrel with the manager prevented its being acted. The next year he published the 'Reproof,' a sequel to the 'Advice,' and of the same stamp, with some bitter lines on Rich, the manager of Covent-garden. In this year, 1747, he married Miss Lascelles, who was to have had 3000*l*., but owing to a suit he obtained only a small portion of this sum. This disappointment, together with sundry extravagances he had been led into, placed him in a very unpleasant pecuniary position, to relieve which he published, in 1748, 'Roderick Random,' the first and best of his novels.

In 1750 Smollett went to Paris, but his prejudices against the French and his ignorance of their language rendered his stay there a short one. The following year he published 'Peregrine Pickle,' which was greatly read and applauded. He now resumed his medical profession, and announced himself as Dr. Smollett. With this character he endeavoured to set up in Bath, and published an unsuccessful pamphlet on the 'External Use of Water.' Disappointed in this design, he again took up the pen as a profession, and fixed himself in Chelsea, where he wrote the 'Adventures of Ferdinand Count Fathom.' In 1755 he published by subscription his translation of 'Don Quixote.' Lord Woodhouslee was the first to detect, in his 'Essay on Translation,' that Smollett had founded his translation on that of Jarvis. Jarvis had a greater knowledge of Spanish; and his translation gives the sense and spirit of the original much better than that of Smollett.

Smollett then visited his relations in Scotland, and on his return to London undertook the management of the 'Critical Review,' which was to oppose the 'Monthly Review.' Among the many whom he attacked in this publication was Admiral Knowles, who brought an action against the printer of the 'Review' for a libel. When judgment was about to be pronounced on the printer, Smollett stepped forward and declared himself the author, and was sentenced to pay 100*l*. and be imprisoned for three months. In 1757 he wrote the 'Reprisals, or the Tars of Old England,' a comedy, which Garrick produced on the stage, where however it had only small success. In 1758 he brought out his 'Complete History of England from the earliest times to the treaty of Aix-la-Chapelle in 1748,' and the work was highly successful.

During his imprisonment he wrote the 'Adventures of Sir Launcelot Greaves,' an imitation of 'Don Quixote.' This novel was printed in detached parts in the 'British Magazine.' The success of his 'Complete History' induced him to continue it from 1748 to 1764. The volume for 1765 was written by Guthrie during Smollett's absence on the Continent. Smollett is also supposed to have written the accounts of France, Italy, and Germany for the 'Universal History.'

On Lord Bute's promotion to the administra-

tion, Smollett defended him against Wilkes in a paper called the 'Briton,' which Wilkes answered by his celebrated 'North Briton.' About 1764 he was engaged in a translation of the works of Voltaire and a compilation entitled 'The Present State of all Nations.' In June, 1763, he went to France and Italy, and on his return published the result of his observations, 'Travels through France and Italy.' Splenetic and prejudiced, this work has long been forgotten. His increasing ill-health made travelling necessary, and he went to Scotland, and from Scotland to Bath. His renewed vigour was shown in the 'Adventures of an Atom,' a violent political satire, wherein, under fictitious names, he abused ministers. But his health again requiring a milder climate, he got his friends to solicit the very ministers whom he had satirized, for a consulship. It can occasion no surprise that this application did not succeed.

In 1770 however he left England again for Italy, writing on the way 'The Expedition of Humphrey Clinker,' a work which has remained a favourite. In the neighbourhood of Leghorn he lingered through the summer of 1771, and died Oct. 21. As a novelist he stands next to Fielding; as a poet his merit is very small; as an historian and a prose writer his greatest claim to praise is his industry.

SMUGGLING is the clandestine introduction of prohibited goods; or the illicit introduction of goods by the evasion of the legal duties. Excessive duties present a temptation to men to evade them; and the law loses a great part of its moral influence when it first tempts to violation of it, and then punishes the offence. In parts of a country where a 'free trade' is extensively carried on, the smuggler is rather a popular person than otherwise; in some countries, as in Spain, still more than in England. The crimes and the moral evils which are the offspring of smuggling can only be prevented by a wise tariff. It annihilates a traffic which no ingenuity can put down; for all experience proves that so long as a profit can be made by smuggling sufficient to counterbalance the risk, it will flourish.

The vicinity of France and England, and the injudicious character of their respective tariffs, have encouraged smuggling to a large extent on both sides of the Channel. Spirits, tea, tobacco, and silk goods, and more particularly brandy, from the high duties imposed on it in this country, have constituted the most important articles of smuggling from France to England. English goods are also largely smuggled into France. The extensive land frontier of France, and the offices for collecting the octroi duties in inland towns, give rise to some peculiarities in the smuggling-trade in France. It is not sufficient to land merchandise on the coast, as in England, but it has to pass the local custom-houses at the barriers of the large towns. This adds greatly to the difficulty and expenses of smuggling. It is stated that in 1831 the premium on landing English woollens on the French coast was 55 per cent.; at the barriers of Paris 63 per cent.; and within the walls 10 per cent. additional; making in all 73 per cent.; the premium on cotton goods being 65 per cent. English goods are chiefly introduced into France by the Belgian frontier.

In 1822 the cost of preventing smuggling in England was enormous. The Preventive Service and the Coast Blockade were organised for this purpose, and were aided by a fleet of 52 revenue cruisers. In 1822 and 1823 there were captured on the English coast 52 vessels and 385 boats engaged in smuggling. For the half-year ending April, 1823, the cost of this department of the public service amounted to 227,145*l.*, and the seizures were valued at 67,000*l.* The Coast Blockade consisted of 1500 officers and seamen of the royal navy, who were employed on shore under the orders of the Admiralty; and the Coast Guard was under the authority of the Board of Customs. In 1832 upwards of 181,000*l.* had been expended in building cottages for the officers and men of the Coast Guard in Kent and Sussex. Lord Congleton estimated the total annual cost of protecting the revenue in 1831 at from 700,000*l.* to 800,000*l.*

For several years frequent conflicts took place between the officers of the revenue and smugglers, who were generally aided by the country people. In 1830 there were 116 persons under confinement in England, and 64 serving in the navy as a penalty for smuggling offences. The counties on the Scottish border were at one period rapidly becoming demoralised by smuggling, the duties on spirits being much higher in England than in Scotland. The duties being reduced more nearly to an equality, these evils ceased on the border; and the quantity of spirits charged with duty in Scotland rose from 2½ million gallons in 1822, to nearly six million gallons in 1825. The reduction of the duties on silks, tea, and other articles, has done more to repress smuggling than all the efforts of the revenue officers aided by a large armed force. In 1841 the number of persons under confinement in England for offences against the Customs laws was 65, all for periods under six months, with two exceptions; in Ireland there were none under confinement.

The direct cost incurred for the protection of the Customs revenue was as follows in 1840:—Harbour vessels, 7250*l.*; Cruisers, 118,543*l.*; Preventive Water-Guard, 349,474*l.*; Land Guard, 19,662*l.*; total, 494,930*l.* The Board of Excise employs cruisers for the protection of the revenue collected under its authority, the cost of which amounted to 5458*l.* in 1840; and also a force in Ireland called the Revenue Police, whose maintenance in the above year cost 42,095*l.* The total charge for collecting and protecting the Customs and Excise revenues of the United Kingdom was 2,309,611*l.*; namely, 1,286,353*l.*, or 5*l.* 8*s.* 8¾*d.* per cent., for the Customs; and 1,023,258*l.*, or 6*l.* 10*s.* 11¼*d.* per cent., for the Excise. The present acts relating to smuggling are 3 & 4 Wm. IV. c. 53, and 4 & 5 Wm. IV. c. 13.

SMUT. [BURNT-EAR.]

SMYRNA, one of the most ancient Greek cities in Asia Minor. There was an Old Smyrna and New Smyrna. The old town lay on the

north-east side of the Hermæan Gulf, which is sometimes called the Gulf of Smyrna. Herodotus (i. 16, 149) says that Smyrna was originally an Æolian colony, and that it was seized by some Ionians from Colophon. According to another account it was an Ionian colony from Ephesus. The Lydian King Sadyattes destroyed Smyrna, but the town was rebuilt four hundred years afterwards by Antigonus and Lysimachus, about 20 stadia from the site of the old town. The new Smyrna became one of the finest and richest cities of Asia, and continued such when it came under the Romans, and was included in the Roman province of Asia. Christianity was early established at Smyrna, and Polycarp is said to have been the first bishop, and to have suffered martyrdom here. The neighbourhood of this city has often suffered from earthquakes. In A.D. 178 Smyrna was reduced by an earthquake to a heap of ruins, but it was restored by the Emperor M. Aurelius.

During the Eastern Empire Smyrna experienced several severe vicissitudes. Towards the close of the 11th century it fell into the hands of Tzachas, a Turkish pirate, and was nearly destroyed by a Greek fleet under John Ducas. It was restored by the Emperor Comnénus, but soon after fell into the hands of the Genoese, who continued in possession of it until the year 1364. In 1402 it was taken by Tamerlane, and suffered very severely. Soon after it came under the dominion of the Turks, under whom it has always been the most flourishing city of the Levant, notwithstanding it has frequently been visited by earthquakes, fires, and the plague.

Smyrna, which the Turks call Izmir, is thus one of the very few ancient cities which have survived to our times. At present it is the most important city of Asia Minor, and the centre of the Levant trade. Of ancient buildings very few traces remain. It rises in the form of an amphitheatre from the sea, and upon the hill there is an ancient castle which forms the citadel; over one of the gates there is a head which either represents Apollo or an Amazon, and over another a Roman eagle.

The modern city of Smyrna is in 38° 25′ N. lat., and 27° 9′ E. long., about 210 miles S.S.W. from Constantinople, direct distance. It is situated at the bottom of a capacious bay, with excellent anchorage, and so deep that large ships come close to the wharfs. The bay extends into the city, and its margin is lined with quays, on which there are handsome stone houses, so that the city, with its domes and minarets, has a fine appearance on approaching it from the bay; but a great part of the interior, and especially that part which is built on the side of the hill, consists of low wooden houses, and the streets are ill paved, narrow, crooked, and dirty. The inhabitants are probably about 130,000, of whom about 70,000 are Turks, 30,000 Greeks, 12,000 Jews, 7000 Armenians, and the remainder natives of various parts of the world, who reside there for purposes of commerce, and occupy, for the most part, the best quarter of the city near the bay. The port is frequented by ships from all nations, freighted with valuable cargoes both outward and inward. The chief imports are—coffee, sugar, indigo, tin, iron, lead, cotton-twist, manufactured goods, rum and brandy, spices, cochineal, and a variety of other articles. The principal exports are—silk, opium, drugs and gums, galls, cotton, wool, valonia, and fruit. Besides these exports there are various kinds of skins, goats' wool, olive oil, wax, and a variety of other articles. This large commerce has obviously arisen, not only from the advantageous situation of the port, but from the liberal policy of the Turkish government, which has imposed hardly any restrictive enactments, with few duties, and those extremely low.

Many of the European states have their consuls at Smyrna, such as England, Sweden, Prussia, France, Venice, &c. The city and its territory are governed by a pasha.

In 1841 a fire broke out at Smyrna, which, from the crowded state of the wooden houses, the want of water, and the violence of the wind, was destructive to a dreadful extent. About 12,000 houses were destroyed, including two-thirds of the Turkish quarter, most of the French quarter, and the whole of the Jewish quarter, with many bazaars, and several mosques, synagogues, and other public buildings. The damage was estimated at two millions sterling. Subscriptions to a large amount were soon raised at Smyrna, Constantinople, and elsewhere. The sultan gave 4000*l.*, and sent ships with articles of food and clothing; and a large subscription was raised in London among the merchants connected with the Levant trade.

SMY'RNIUM, a genus of plants belonging to the natural order *Umbelliferæ*. *S. Olusatrum*, Common Alexanders, is a native of the middle and south of Europe in humid places. It is found in Great Britain, and is observed most frequently near the coast, although not confined to such a locality. This plant was formerly much eaten in Europe both as a salad and potherb. *S. perfoliatum*, Perfoliate Alexanders, was obtained in Greece by Dr. Sibthorp, and it is also an inhabitant of Spain, Italy, and Dalmatia.

SNAILS, the English name for the Slugs and Shell Snails. [HELICIDÆ; LIMAX.]

SNAITH. [YORKSHIRE.]

SNAKE, a term commonly applied to any serpent, but more particularly used to designate the Common Snake, *Natrix torquata*. [NATRIX.]

SNAKE-ROOT. [ARISTOLOCHIÆ.]

SNAPDRAGON. [ANTIRRHINUM.]

SNELL, WILLEBRORD, was born in 1591, at Leyden, in the university of which city his father, Rudolph Snell, was professor of mathematics. He at first applied himself to the study of the law, but he very soon abandoned that pursuit, and devoted himself to the mathematics. At 17 years of age he published an essay, in which it was attempted to restore the lost treatise of Apollonius, 'De Sectione determinatâ.' The work procured for the author a reputation among the scientific men of that time, but it has lost its importance since the publication of the more complete restoration by Dr. Robert Simson.

In order to acquire information relative to

scientific subjects beyond that which his own country afforded, Snell travelled to Germany, where he obtained an introduction to Kepler. On his return to Leyden, three years afterwards, his father having resigned his post in the university, young Snell was appointed to succeed him. In 1613 Snell published an explanation of the monetary system of the ancients, 'De Re Nummariâ Liber Singularis,' Antwerp, 8vo. His second and most important published work was entitled, 'Eratosthenes Batavus de Terræ Ambitûs verâ Quantitate à W. Snellio suscitatus' (Leyden, 1617): it contains a description of the method of determining the magnitude of the earth by trigonometrical operations, combined with the observed latitudes of the stations.

He published, in 1619, 'Descriptio Cometæ qui ann. 1618 primum effulsit,' 4to.; and two years afterwards 'Cyclometricus, seu de Circuli Dimensione,' in which is given an approximation to the value of the circumference of a circle by a method more short than that of Van Keulen. His next work (1624), called 'Tiphys Batavus,' constitutes a treatise on navigation; and in 1627, that is, after his death, Hortensius of Delft published his 'Doctrinæ Triangulorum Canonicæ Libri Quatuor.'

According to Vossius and Huygens, Snell was the first who made the discovery that if a ray of light be incident on a refracting surface, and be produced within the medium, the parts of the refracted ray and of the produced incident ray intercepted between the point where the refraction takes place and any line passing through them perpendicularly to the refracting surface, have to each other a constant ratio. This discovery, which is said to have been made in 1621, is no other than the now well-known law between the sines of the angles of incidence and refraction, which Descartes published in his 'Dioptrics,' in 1637, as the result of his own researches. The experiments by which Snell discovered the law were never published; but Huygens states that he had seen the manuscript containing an account of them; and Vossius relates that the heirs of Professor Hortensius communicated the contents of the manuscript to Descartes.

After having suffered during several years from ill health, Snell died, Oct. 31, 1626, when 35 years of age.

SNEYDERS, or SNYDERS, FRANCIS, born at Antwerp in 1579, was a pupil of Henry van Balen, and for a time followed the style of his preceptor, confining himself to the representation of fruit, flowers, and other objects of still-life. He soon attempted the more difficult task of painting animals, in which he remains to this day, if not without a rival, at least inferior to no other artist. It is doubtful whether he ever went to Italy. During part of his career he lived at Brussels, having been invited there by the Archduke Albert, governor of the Low Countries, for whom he painted some of his finest works, particularly a stag-hunt, which was sent by the archduke to Philip III. of Spain, who was so charmed with the present, that he gave the artist commissions for several large pictures of huntings and other similar compositions, and which, down to a recent date, were in the old palace of Buen Retiro. Rubens and Jordaens both availed themselves of the talents of Sneyders in his peculiar vocation, and there are known to be several pictures in existence the joint production of these three great but friendly rivals. The works of Sneyders are in many of the best collections in England. There are a few etchings by Sneyders, some of which are very spirited and masterly. He died at Antwerp in 1657.

SNIPE, the English name for those grallatorial birds which belong to the second section of the *Scolopacidæ*, and form the genus *Galinago*, Stephens.

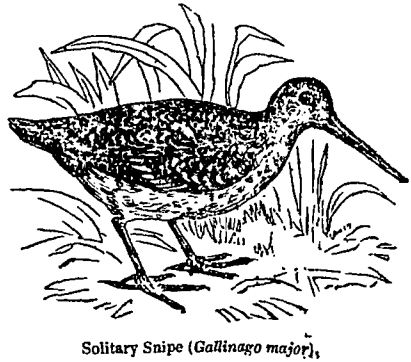
The Snipes most familiar to the English sportsman are the Common Snipe (*Gallinago scolopacinus*, Bonap.), the Jack Snipe, and the Solitary Snipe. Sabine's Snipe (*Scolopax Sabini*) is of rare occurrence.

The Common Snipe is the *Beccacino* and *Pizzarda* of the Italians; *Bécassine* or *Bécasseau* and *Chèvre volant* of the French.

The range of the Common Snipe is very extensive, at least in Europe and Asia. Numbers from Norway and Northern Europe visit our marshes and oozy grounds every autumn; but besides these, we are not without homebred flocks, especially in Dorsetshire, the New Forest, Cambridgeshire, Wales, and some parts of Scotland.

The snipe is a bird too well known to require a detailed description.

The Solitary or Great Snipe (*Gallinago major*, Bonap.) is the *Grande Bécassine* of the French; *Beccacino maggiore*, *Pizzardone*, and *Croccolone* of the Italians; and *Doppelschnepfe* of the Germans.



Solitary Snipe (*Gallinago major*).

Geographical Distribution.—Chiefly the north of Europe. Norway, Sweden, Germany, Holland, France, Italy, Switzerland, the borders of Asia, Trebizond, the neighbourhood of the Caucasus.

In the British Islands the bird has been killed in Lancashire (the specimen from which Pennant first described it, and which was preserved in the Leverian Museum), and has been noticed as not uncommon in Norfolk. Mr. Yarrell says, 'Their course both in the spring and autumn (at which period they have been generally shot in this

country) is considered by Mr. Selby to be generally to the east of the longitude of the British Islands; and I may mention, in corroboration of this view, that I am not aware of more than one record of the occurrence of this species in Ireland, and in England they are most frequent in the eastern counties.' This species, like the rest of its genus, breeds in morasses and swamps, selecting a tuft of grass, or bunch of rushes, for the site of the nest.

For further details regarding the *Scolopacidæ*, including the Snipes, see article SCOLOPACIDÆ.

(Selby; Gould's *Birds of Europe;* Yarrell's *British Birds.*)

SNORRI STURLUSON, also called *Sturleson* or *Sturlason*, and in Latin works *Snorro*, was the son of Sturla, and born in Iceland in the year 1178. When Snorri had scarcely attained his fourth year, his father died, and he was thenceforth educated at Odi, in the house of Ion, the most learned man of the age. His education was conducted with great care. Although his father had been the chieftain of an Icelandic tribe, the son appears to have been poor, until his marriage with a wealthy lady, whom some years afterwards he deserted. He managed his newly-acquired property so well that he became as distinguished for his wealth as for his learning. He gradually rose to the rank of Landur-Madur and of Yarl, the highest title next to that of duke. During this period of his prosperity he composed some of the most beautiful tales (sagas) that exist in the Icelandic language. His moral character however was not equal to his intellectual. He was avaricious and quarrelsome, and a party was formed against him, which drove him from the island (1234). He afterwards returned to Iceland, where he was murdered by his own sons-in-law (1241).

Snorri is one of the greatest and the last of the northern Scalds. His most important work is the 'Heimskringla,' a beautiful collection of sagas, consisting partly of Scaldic songs by Snorri himself, and partly of the poems of earlier Scalds, whose poems are interwoven in the Sagas of Snorri himself. A second edition of this collection was published, with a Danish and Latin translation, at Copenhagen from 1777 till 1826. The last Danish translation is that by Grundtvig, Copenhagen, 1818–1822, 3 vols. 4to. It has also been translated into German by Wachter, who has added a valuable historical and critical introduction. Other works also are ascribed to Snorri, which form part of the 'Skallda,' edited by Rask (Stockholm, 1818), under the title of 'Snorra-Edda ásamt Skáldu.'

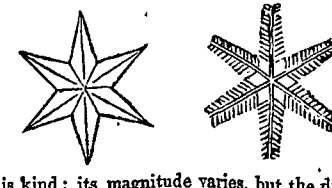
SNOW. When the aqueous particles produced by the precipitation of vapour [RAIN], in descending through the atmosphere, become frozen in separate crystals of ice, and these afterwards unite together in such a manner as to reflect light to the eye in great abundance from all, thus producing a sensation of whiteness, the assemblages of crystals constitute flakes of snow. When the atmosphere is tranquil and the temperature very low, the small flakes appear to assume some regular figure. From such as have been observed, it is found that these consist of brilliant spicular icicles, which diverge from a centre in six directions, and resemble stars having so many rays, upon each of which small crystals are sometimes formed; but if the atmosphere is agitated, the original flakes strike against each other, and uniting in groups, they descend in irregular forms. In regions of the earth far to the north or south, the air, when allowed to enter through a small aperture into a heated apartment, has frequently caused the warm vapour to be converted into snow.

Snow has also been observed to fall in a fine powder, and then it is considered as being in an elementary state. The crystals are evidently those of ice combined together, and their primitive form is, from the experiments and observations of Sir David Brewster, considered as belonging to the pyramidal system. The electrical fluid is found to exist in snow as well as in rain; and to this has been ascribed the regularity of its formation. The specific gravity of snow is very variable; but M. Quetelet has found that the greatest density is nearly one-third of that of water, the temperature being 34.5° Fahr.

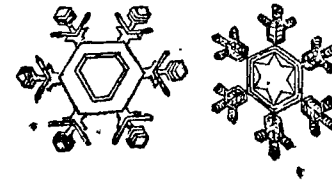
The flakes of snow have, even in temperate regions, many varieties of form, and are often very elegant; but the polar regions of the earth are those in which nature has displayed her power in creating this species of beauty in the highest degree, and to the greatest extent; and Mr. Scoresby, in his 'Account of the Arctic Regions,' has given many varieties of the flakes. Besides dividing them into classes, he has also expressed their magnitudes, and the state of the barometer and thermometer when the snow fell.

Of these classes the first is called 'lamellar,' and is divided into many different species; one of the latter is a thin transparent hexagonal plate, with, sometimes, a starlike figure in the centre. Another species, and this is the most ordinary appearance of snow, is the stelliform; the figures 1 and 2 represent the most remarkable varieties of

1. 2.



this kind; its magnitude varies, but the diameter of the greatest is about ¾ inch, and it occurs most abundantly when the temperature of the air is near the freezing-point of water. The two following figures represent assemblages of hexagonal crystals; they are ½ of an inch in diameter, and are usually formed at temperatures between 32° and 20° Fahr.



The second class is also lamellar, but it differs from the former in having a spherical nucleus, either transparent or white, about $\frac{1}{4}$ inch diameter. The temperature at which this class is formed varies also from the freezing-point to 20° Fahr.

The third class consists of spiculæ, or six-sided prisms; of these, the finer sort, which are formed at the temperature of 28°, resemble white hairs very delicate and clear, and about $\frac{1}{4}$ inch long; the coarser kinds are formed in the lower region of the atmosphere, at about the freezing temperature.

The fourth class is of a pyramidal form and about $\frac{1}{20}$ inch high, but Mr. Scoresby could not determine whether the base was triangular or hexagonal. The fifth class consists of hexagonal crystals united together by a slender spicular crystal, so as to resemble two wheels with an axle. Both of these kinds are very rare.

Snow in the form of cylinders and spheres or spheroids has been occasionally observed in North America. These were produced by the snow deposited in a second shower upon some which had previously fallen, and the surface of which had been covered by a thin coating of ice; their forms arising, in most cases, from the masses being rolled on the ice by the action of the wind. The greatest of the cylinders was $2\frac{1}{2}$ feet or 3 feet in diameter; and the spheres varied from 1 inch to 15 inches in diameter. (Silliman's 'Journal,' vols. ii and vi.)

That animalculæ exist in snow is evident from an observation stated in that 'Journal' (vol. xviii.). Dr. Mure having first examined some water in a glass by means of a microscope, and found it quite pure, put into the water a quantity of snow; he then found that, on solution, the water exhibited in full activity hundreds of animalcules, which, when viewed through the microscope, resembled very diminutive shrimps, and were quite unlike the eels discovered in acetous acid. It may be observed here, that snow-water, being drunk, is considered as unfavourable to the human constitution; the affections of the throat to which the people in some parts of Switzerland are subject, are thought to be caused by its deleterious qualities.

The formation of hail is a result of the abstraction of caloric from the molecules of vapour in the atmosphere, by the agency of electricity or otherwise. The hypothesis proposed by Volta, that hail is formed by the collision of electrical clouds, has been objected to by M. Arago; and the theory of Hutton respecting the formation of rain [RAIN] is considered capable of accounting also for the phenomena both of snow and hail. The loss of heat in the descending molecules is greater when hailstones are formed than when the vapour is brought to the state of rain or snow. This hypothesis appears to be confirmed by the fact that the same cloud has produced both rain and hail.

Hoar-frost is only dew frozen immediately upon being formed. [DEW.]

SNOW, RED. The occasional occurrence of snow coloured red has for a long time created great interest, especially as the labours of the most eminent naturalists have not yet been able to determine precisely to what causes this singular phenomenon owes its origin.

In the year 1819 Captain Ross, whilst in Baffin's Bay, 75° 54′ N. lat. and 67° 15′ W. long., discovered a range of cliffs, covered with snow of a crimson colour. The cliffs were about 600 feet high, and were coloured for the extent of eight miles. According to Captain Ross the party he sent on shore 'found that the snow was penetrated even down to the rock, in many places to a depth of twelve feet, by the colouring matter, and that it had the appearance of having been a long time in that state.'

This matter was described by Mr. Robert Brown, the botanist, as a probable genus of the family of *Algæ*, and pointed out its resemblance to the *Tremella cruenta*. At the same time some of the red-snow water brought from Baffin's Bay was sent to Francis Bauer, who published the results of a very careful examination of it under the microscope, in the seventh volume of Brande's 'Journal of Science and Arts,' accompanied with several drawings. He found that the water contained a number of opaque or red spherical globules, which were heavier than the water, forming a sediment at the bottom of the bottle, and also of some transparent vesicular bodies which floated about in the fluid. On examining the red globules, he found them possessed of a pedicel resembling that of some species of *Uredo*, and regarded them as a species appertaining to this genus. On exposing the water with the globules for some days to the air, he found that they lost their colour. On comparing the chemical analysis of the *Uredo fœtida* with that of the red snow, he found that they in a great measure agreed, and hence he came to the conclusion that the colouring matter of the red snow was a fungus belonging to the genus *Uredo*, and to which he gave the name *Uredo nivalis*.

In 1825 Dr. Greville, of Edinburgh, received specimens of red snow from the polar regions, and also from the island of Lismore in Scotland. After an accurate examination he also came to the conclusion that it was a plant, and named it *Protococcus nivalis*.

In the same year Sir William Hooker, in the 'Appendix to Parry's Second Voyage to the Arctic Regions,' described, under the name of *Palmella nivalis*, the plant of the red snow collected in that expedition. In August, 1839, Mr. Shuttleworth, an English gentleman resident in Switzerland, being at Grimsel, made some observations on red snow recently procured. Having melted the snow and placed some of the red matter on the field of the microscope, he was surprised at finding, instead of the immoveable globules of an Alga, an immense number of exceedingly active animalculæ, not of one form only, but of various sizes and forms.

In 1840 Professor Agassiz of Neufchâtel made a visit to the glacier of Aar, and confirmed the researches of Shuttleworth, having found all the animalcules mentioned by him and some others.

In the various researches referred to above, no mention is made of snow of any other colour than

red. Martius however, a naturalist who accompanied the French expedition to Spitzbergen, mentions having found in one instance a field of green snow. It was accompanied however with the *Protococcus*, giving a red colour. From many observations Martius arrived at the conclusion that the red globules of the green snow are identical with those of the red snow, and that the green snow (*Protococcus viridis*) and the red (*P. nivalis*) are one and the same plant, only in different stages of development, but that it is difficult to state which is the original. The late Professor Meyen remarks on this statement that these *Protococci* are not plants, but animals, the *Euglena sanguinea* and *E. viridis* of Ehrenberg. The reason of their being so often taken for plants is, that they naturally pass a great portion of their existence in a passive state, only occasionally under favourable circumstances starting into activity. When they do this, their spherical form is changed, and they become the elongated beings described and figured by Ehrenberg.

SNOWDON. [CAERNARVONSHIRE.]

SNUFF. [TOBACCO.]

SNYDERS. [SNEYDERS.]

SOANE, SIR JOHN, was born at Reading, Sept. 10, 1753. His father was a bricklayer or petty builder. At an early age he was taken into the office of Dance, the architect, first as errand-boy or attendant, but afterwards on the footing of a pupil. He subsequently studied under Holland, with whom he remained up to the time of his being sent to Italy as travelling student of the Royal Academy.

During his stay in Italy (1777–1780) he made good use of his time in the study of ancient buildings. He also made some original designs, among which were those for a British Senate House and a Royal Palace. On his return to England, he made designs for several private residences and country-seats in the counties of Norfolk, Suffolk, &c., the plans and elevations of which he published in a folio volume, 1788. He next obtained the lucrative appointment of architect to the Bank of England, and about the same time he married Miss Smith, the niece of Mr. George Wyatt, a wealthy builder in the city, by whose death he soon afterwards came into possession of a considerable fortune in right of his wife. Other advantageous appointments followed: that of clerk of the works to St. James's Palace, 1791; of architect to the Woods and Forests, 1795; and of surveyor to Chelsea Hospital, 1807; besides that of professor of architecture at the Royal Academy in 1806. Numerous commissions for both public and private buildings, in addition to his official engagements, kept him in constant occupation for many years; yet notwithstanding his undeniable attachment to his profession, and his industrious application to it, the majority of the buildings that he executed are little better than so many experimental attempts at originality, with considerable merit in parts, but more or less failures upon the whole. The north-western angle of the Bank in Princes Street is his best work. Some of his modes of admitting light were happy The new government offices erected by him at Whitehall were tame and ineffective, and have been since remodelled by Barry. The favourite employment of his latter years was upon his house and museum in Lincoln's-Inn-Fields, London, the exterior of which is by no means such a specimen of taste as an architect would be ambitious to bequeath to posterity. In 1833 he obtained an act of parliament vesting his museum, library, &c., in trustees, for the use of the public after his death. He died at his house in Lincoln's-Inn-Fields, Jan. 20, 1837.

SOAP. This term originally meant the compounds derived from the union between fatty bodies and the alkalis potash and soda; and although it is still usually thus limited in its meaning, it has nevertheless been extended to compounds of oleaginous bodies with some earthy and metallic bodies, having but few properties in common with soap properly so called.

It has been found by Chevreul that different varieties of fatty matter consist chiefly of two kinds: one hard, to which he gave the name of *stearin*; and the other soft, which he termed *olein*. He also discovered that stearin is composed of stearic acid and a peculiar principle which, on account of its sweet taste, he named *glycerin*; and it was further proved by his experiments that olein consists of oleic acid and glycerin; stearin is therefore a stearate of glycerin, and olein an oleate of the same substance.

When, in the manufacture of soap, an alkali (soda, for example) is heated with tallow, the soda gradually dislodges the glycerin from combination with the stearic and oleic acids, and by combining with them forms soap, or in other words a compound of stearate and oleate of soda, and the glycerin remains in solution.

The principal kinds of soap manufactured in England are *white* or *curd soap*, made chiefly from tallow and soda, but for some particular purposes olive-oil and soda; *yellow soap*, composed of tallow, resin, and soda, to which some palm-oil is occasionally added; and *mottled soap*, made from tallow, kitchen stuff, and soda; the mottled appearance is given to this soap by dispersing the lees through it towards the end of the operation. There is also a *brown soap*, made from palm oil and resin. *Soft soap* is generally prepared from fish-oil and potash.

The harder or soda soaps are prepared by boiling the fatty matter with an aqueous solution of caustic soda; when combination has taken place, or in other words, when the soap is formed, a quantity of common salt is added, which, dissolving in the lees, increases their density, and the soap then floats on the surface of the liquid. The fire being then extinguished, the semifluid soap, after a proper interval, but while yet hot, is removed from the lees and put into frames of wood or iron, where it remains until it has become cold and hard, when it is cut into bars for sale. In making soft soap no lees are separated, the whole of the solution of potash, which is made strong on that account, being combined with the oily matter used.

The soaps which have the alkalis for their bases are soluble in water, though the solution is

in general milky; they are also soluble in alcohol, and the solution is used frequently as a test of what is called the hardness of water; acids also decompose soaps.

Soap Trade.—The soap manufacture is one of considerable importance. The principal seats in England are Liverpool and Runcorn, London, Brentford, Bristol, and Hull; there are also soap-works of considerable extent at Bromsgrove, Newcastle, Gateshead, Warrington, and Plymouth. In Scotland two-thirds of the total quantity of soap are made at Glasgow and Leith. In Ireland soap is chiefly made at Belfast, Londonderry, Limerick, and Cork.

In 1711 an excise duty of 1*d.* per lb. was first imposed on all soap made in Great Britain, which was raised in 1713 to 1½*d.* per lb. In 1782 the duty was again increased, and a distinction was for the first time made between hard and soft soap, the duty on the former being 2½*d.*, and on the latter 1¾*d.* per lb. In 1816 another increase of duty took place, and hard soap was subjected to a duty of 3*d.* per lb. In 1833 the duty was reduced to 1½*d* per lb. on hard soap, and 1*d.* per lb. on soft. The present duty is 1½*d.* per lb. and 5 per cent. on hard soap; 1*d.* per lb. and 5 per cent. on soft soap.

The interference of the Excise in the manufacture of soap was exceedingly arbitrary and vexatious, until the establishment of more liberal measures by an act passed in 1840.

The quantities of soap made in Great Britain in 1848 were as follows:—

	Silicated. lbs.	Hard. lbs.	Soft. lbs.
England .	1,572,468	157,667,499	9,689,090
Scotland .	605,420	14,187,429	5,730,847
	2,177,888	171,854,928	15,419,937

Making a total of 189,452,753 lbs. The foreign soap imported in that year amounted only to 91,784 lbs. The British soap exported to foreign countries amounted to 11,187,997 lbs., with a declared value of 155,267*l.*

SOAP, *Medical Uses of.* In pharmacy and medicine the term soap is applied to combinations not only of oily and fatty matters with the alkalis soda or potash, but also with the volatile alkali (ammonia), lime (an alkaline earth), and metallic oxides, especially oxide of lead; likewise to solutions of resins in liquid potash, such as guaiacin [GUAIACUM], called therefore *Sapo guaiacinus.* The combinations of oils with ammonia or lime, being very thin, are generally termed *Liniments;* the common one of hartshorn with oil is an example of the former, while oil and lime-water constitute the common application to burns termed Carron Oil, from its frequent employment in the great iron-works at that place. The combination of oil with oxide of lead is generally termed a *Plaster.* Some combinations of a volatile or fixed oil with an acid are sometimes called soaps, such as that of oil of turpentine with hydrochloric acid (artificial camphor), or of almond oil with sulphuric acid (*Sapo acidus*): but these are scarcely entitled to be so regarded. Among continental pharmaceutists, many cerates and mixtures of metallic salts with common soap are termed soaps, but they are more correctly called plasters.

Of soaps properly so called there are two kinds, the *soluble* and the *insoluble.* To the first belong the soaps of soda, potash, and ammonia; to the latter, the combinations with lime and lead; but even the soaps of soda and potash are only perfectly soluble in soft water, for hard waters, especially those abounding in salts of lime, decompose the original union and form an insoluble soap.

Soaps are further divided into *hard soaps,* when soda is employed in their formation, and into *soft soaps,* when potash is used: each of these presents some varieties according to the nature of the ingredients associated with them in the manufacture. A soap is sometimes prepared in which both alkalis are used, but it belongs to the class of soft soaps.

Soft soap is directed by the London Pharmacopœia to be made with potash and olive oil, but this order is seldom complied with. The soft soap above mentioned, in which both soda and potash are used, is made with olive and other oils and tallow. It is employed only to form the compound sulphur ointment. Common soft soap is made with train or cod-fish oil and tallow; from its ordinary appearance, it is sometimes called Black Soap. If a slight excess of alkali exist, its detergent powers are thereby heightened. Soft soap is of great service in many cutaneous diseases, several of which, when in a mild form, may be cured by it alone. It may be rendered still more useful by the addition of sulphur or sulphuret of potash (liver of sulphur). In the treatment of scabies, porrigo (ring-worm), and such diseases, this application is far superior to the ointments and other greasy compounds commonly employed, which increase the filth or uncleanness by which the disease is aggravated. It is also much cheaper.

SOAPSTONE. [STEATITE.]

SOBIESKI, JOHN, son of James Sobieski, a Polish noble, was born in 1629, in the district of Olesko, in the present Galizia, or Austrian Poland. He was carefully brought up by his father; completed his education at Paris; served for some time in the body-guards of Louis XIV.; and travelled with his brother in France, Italy, and Turkey. He served in the Polish army with distinction against the Cossacks and Tartars, as well as against the Swedes and Russians. In 1660 he gained a victory over the Muscovite general Sheremetoff; and for several years he continued to fight with success against both Muscovites and Tartars, and was raised to the dignities of grand marshal and grand hetman of Poland.

In 1667 Poland was invaded by 100,000 Cossacks and Tartars. Sobieski marched to meet them at the head of only 20,000 men; routed them, and compelled them to sue for peace. In 1671 he defeated the Turks, who were led by Mahomet IV.; and took from them the fortress of Kotzim, till then considered impregnable. On the death of king Michael Wisniowietski, in 1674, the diet assembled to name a successor. Several candidates appeared; but the palatine Stanislaus Jablonowski proposed John Sobieski. The effect was electrical; all the Polish and Lithuanian

nobles shouted 'Long live John III.,' and John was proclaimed king. The country was in a state of exhaustion, the regular army consisted of only a few thousand men, the treasury was empty. Sobieski raised several regiments at his own expense, and then marched to oppose the Turks, who were advancing with a large force. With a small but devoted band he issued from the town of Lemberg, and completely routed his enemies. A fresh Turkish army numbering between two and three hundred thousand came, at the head of which was the pasha of Damascus, who had acquired in war the surname of 'Shaïtan,' or 'the Devil,' accompanied by a formidable artillery. Sobieski entrenched himself, with about 10,000 men, between two villages on the banks of the Dniester, and there sustained for twenty days the attacks of the enemy and a continued cannonade. At length when on Oct. 14, 1676, the Polish king issued out of his entrenchments in order to engage with the disproportioned hosts, 'Shaïtan' pasha offered him an honourable peace, which was accepted.

A few years of peace followed, at least external peace, for Poland was seldom if ever at peace within herself. But a new storm was gathering to draw out Sobieski's energies. A most formidable army, commanded by the grand-vizier Kara Mustapha, after sweeping over Hungary, in July, 1683, invested Vienna, from which the emperor Leopold and his family had fled. The Polish king had no reason to love Austria, but, as a Christian prince, he determined to defend the eastern bulwark of Christian Europe against the dreaded Ottomans. Having been joined by the Duke of Lorraine and other German princes with their contingents, he at length found himself at the head of 70,000 men. On the morning of Sept. 11, the allied army, reaching the summit of the ridge of the Kahlenberg, which overlooks the Austrian capital, saw before them the tents of the Ottoman host in the plain below. On the following day Sobieski commenced his attack upon the camp; the Turks made but an ineffectual resistance; and the Polish king remained master of the whole artillery, baggage and all. Sobieski pursued the Turks into Hungary, where he experienced a defeat at Parany; but he defeated them again at Strigonia, and cleared the whole country of them.

Returning to his own kingdom, he found himself again involved in domestic troubles. Every attempt that he had made for the regeneration of Poland was thwarted by some of the nobles, by means of the veto which the constitution gave to each. In the midst of these troubles, and his fears of the approaching fall of his country, he died on Corpus Christi Day, 1696. He was a great man, a successful soldier, and an accomplished scholar. [South, Robert.]

SOCCAGE (more correctly *socage*), in its original signification, according to Bracton, Littleton, and others, is service rendered by a tenant to his lord by the soc (*soke*) or ploughshare. The term was afterwards extended to all services rendered which were of non-military character, and were fixed. The certainty of the services distinguished socage tenure from tenure in chivalry, or by knight's service, on the one hand, and from tenure in pure villenage by arbitrary service, on the other; and therefore Littleton says, s. 118, 'A man may hold of his lord by fealty [Fealty] only; and such tenure is a tenure in socage; for every tenure which is not a tenure in chivalry is a tenure in socage.'

Socage is said by old writers to be of three kinds: socage in frank tenure; socage in ancient tenure; and socage in base tenure. The second and third kinds are now called respectively tenure in ancient demesne and copyhold tenure. The first kind is called free and common socage, to distinguish it from the two others, though as the term socage has long ceased to be applied to the two latter, socage and free and common socage now mean the same thing.

Besides fealty, which the tenant in socage, like every other tenant, is bound to do when required, the tenant in socage, or, as he was formerly called, the socager or sockman, is bound to give his attendance at his lord's court-baron, if the lord holds a court-baron, either for a manor [Manor] or for a seigniory in gross. If the tenant in socage holds by fealty and certain rent to pay yearly, &c., the lord shall have of the heir of his tenant as much as the rent amounts unto which he payeth yearly. This payment on the death of a tenant is a relief. Many of these rents are of little value, as a pound of pepper, or a pair of gloves. (Littleton, s. 128.)

Both forfeiture and escheat are incident to tenure in socage, as they were also to tenure by knight's service. [Escheat.] In gavelkind there is no forfeiture.

Wardship is also incident to this tenure. But this incident is not, as formerly in knight's service, a benefit given to the lord, but a burthen imposed on the infant's next friend of full age, who must however be a person not capable of inheriting the estate upon his young kinsman's death.

By the 12 Car. II. c. 24, the provisions of which were extended to Ireland by the Irish act of 14 & 15 Car. II. c. 19, tenure by knight's service was abolished, and all lands, with the exception of ecclesiastical lands held in free alms [Frankalmoigne], were directed to be held in free and common socage, which, with the limited exception in favour of lands held in frankalmoigne, is now the universal tenure of real property throughout England and Ireland, and those colonies which have been settled by the English.

It is true that a large portion of the soil of all those countries is held by leaseholders, and in England also by copyholders; but the freehold of the land held by leaseholders and copyholders is in their lords or lessors, who hold that freehold by socage tenures. (On socage tenures, see Coke on Littleton, s. 117, &c., and the notes in Butler's edition.)

SOCIAL CONTRACT, or ORIGINAL CONTRACT. Locke thus expounds his doctrine of the Social Contract ('Essay on Civil Government,' ch. 8, 'Of the Beginning of Political Societies'): he says that 'men being by nature all free, equal, and independent, no one can be put out of his estate and subjected to the political power of

another without his own consent.' By *can* he does not mean to say that it may not happen that one man shall be subjected to the political power of another, but that he cannot properly or justly be subjected without his consent; which appears from what follows:—'Whosoever therefore out of a state of nature unite into a community must be understood to give up all the power necessary to the ends for which they unite in society, to the majority of the community, unless they expressly agreed in any number greater than the majority. And this is done by barely agreeing to unite into one political society, which is all the compact that is or needs be between the individuals that enter into or make up a commonwealth. And thus that which begins and actually constitutes any political society, is nothing but the consent of any number of free men capable of a majority to unite and incorporate into such a society. And this is that, and that only, which did or could give beginning to any lawful government in the world.' The conclusion as to the origin of '*lawful* government' by implication contains the notion that some governments are not lawful, whereas all men must and do admit that all governments which can maintain themselves are governments, and the term lawful is not applicable to that power which can declare what is lawful. The two objections which Locke mentions as being made to the theory are:—1. 'That there are no instances to be found in story of a company of men independent and equal one amongst another, that met together, and in this way began and set up a government.' 2. That 'it is impossible of right that men should do so, because all men being born under government, they are to submit to that, and are not at liberty to begin a new one.' Locke replies to both objections with considerable ingenuity, but no sound thinker or political writer at present will admit his answer to be conclusive.

The origin of government lies in the constitution of man's nature. Man is a social animal, and cannot exist out of society. He is of necessity born in a society, that is, a family, the smallest element to which we can reduce a state. He who requires not to live in a society, says Aristotle, must be a beast or a god. ('Politik.,' i. 2.) The nature of man compels him to seek union with the other sex. A man by himself is not a complete being: by the constitution of their nature man and woman must unite; and this is the foundation of a family; a family, which is thus determined by the very law of our existence, is the element of society. 'Man,' says Aristotle, 'is by nature a political animal;' and by his nature he has an impulse to political union. He therefore follows the law of his nature by living in political society, as much as he obeys it by uniting himself with a woman. The form of any particular government, and the mode in which it may have been established, are the accidents, not the essentials, of political union, the real foundation of which is in our nature, and it is a necessity, not a choice. But inasmuch as every community exists for some good end (Aristotle), we estimate the value of any particular government by its fitness for this end, and the accidents of its form are subordinate to that for which pursuant to its nature it exists. Its origin may in many cases have been as obscure, and as little perceived, as the origin of those customs which exist in such endless variety in the world. Nobody supposes that customs originated in universal consent, expressed in any formal way, or that people who follow them, or at least the majority who follow them, ever consider why they follow them. He who can trace the origin of customs, or the origin of languages, can trace the origin of government.

The theory of men living in a state of nature and thence proceeding to form political societies has apparently derived some countenance from the condition of many savages. There are perhaps people who may be said to have no government, if it be true that among some savages there is no bond of union except that of families. If this is so, each family is ruled by its head, like the families of the Cyclops (Aristotle, 'Politik.,' i. 1), so long as the head can maintain his dominion. This state, if it exists anywhere, is perhaps what some people call a state of nature; but it is in fact a very imperfect state of nature, for the perfect state of nature is a political society, because it is that state to which the nature of our constitution impels us.

SOCIAL WAR, also called the Marsian or Italian War, lasted from 91 till 89 B.C., and was the most formidable war ever carried on in Italy during the dominion of the Romans. It arose from the desire of the Italians to be placed on a footing of equality with the Romans. The Italians contributed to the maintenance of the republic, and a great portion of the Roman armies consisted of them. They accordingly wished to have a share in the administration of the state which they upheld, and for which they were shedding their blood. Attempts to bestow the franchise upon the Italians had been made by C. Gracchus and M. Fulvius, but their hopes had been disappointed by the Roman aristocracy. During the period preceding the outbreak of the Social War, several distinguished Italians had taken up their abode at Rome, and had exercised the Roman franchise, and the Romans had connived, and tacitly recognised their citizenship. But just at the time when the Italians began loudly to demand the franchise, the consuls L. Licinius Crassus and Q. Mucius Scævola the pontifex (95 B.C.) carried the Lex Licinia Mucia, which enacted that all those who had illegally exercised the Roman franchise should quit Rome. This act created great exasperation among the Italians, though they still hoped that their claims might be granted in a peaceful way. Four years passed without anything being done, until in 91 B.C. the tribune Livius Drusus renewed the attempt of Gracchus and Fulvius; but he was assassinated before he had attained his object. Immediately after this act of violence another law (Lex Varia) was carried by the tribune Q. Varius, which enacted that all those should be prosecuted who had either publicly or secretly supported the claims of the Italian allies. The Italians now took up arms, as they had no other hope; and a confederacy was formed among the Picentini,

Sestini, Marsi, Peligni, Marrucini, Samnites, and Lucani. The Latini, Etrusci, Umbri, and Campani, did not join them. The events of this war are very imperfectly known from the fragmentary notices of the ancient writers. The object of the Italians was to overthrow the supremacy of Rome, and they seemed at one time to have a fair chance of accomplishing their design. The Etruscans and Umbrians also began to join the confederates, but they were soon reconciled to Rome. In B.C. 90 the Romans, being in great difficulties, devised an admirable plan for strengthening themselves by the Lex Julia de Civitate, B.C. 90, which conferred the Roman franchise (Romana Civitas) upon all the Latins and Socii, who had remained faithful to Rome. Upon these new citizens Rome could now place full dependence, and her armies were strengthened by them. The first signal victory which the Romans gained was in 89 B.C., under the consul Cn. Pompeius Strabo, who defeated 70,000 Italians at Asculum, which was destroyed. After other advantages gained by the Romans, several of the confederates deserted the common cause, and concluded separate treaties with Rome, until at last the Samnites and Lucanians alone carried on the war. At last the Romans promised the Roman franchise to all who would lay down their arms. The offer was accepted by all, with the exception of the Samnites, who were resolved either to conquer or to perish, and who, in the civil war which soon ensued, joined the party of Marius. The result was that Rome, notwithstanding the reverses of the Italians, was compelled to grant what she had obstinately refused; but this refusal cost her and Italy the flower of their population, for nearly 300,000 lives were lost during these fatal two years (Vell. Pat., ii. 15), many towns were destroyed, and many districts laid waste, which never recovered their former prosperity.

SOCIETIES, ASSOCIATIONS. The great increase of societies or associations is characteristic of the present condition of Europeans in Europe and of Europeans who have settled in other parts of the world. Association for particular objects is analogous to the great associations of political societies, but with this difference, that their object is something particular, and that they are really established and exist by the consent of all the individuals who compose them.

Societies have been formed for nearly every variety of object. There are societies for objects scientific and literary, sometimes called academies; for objects religious and moral; and for objects which are directly material, but in their results are generally beneficial to the whole of mankind. There are societies for objects which the members consider useful, but which other people consider to be mischievous. Generally, in this country, it may be stated that any number of individuals are permitted to contribute their money and their personal exertions for any object which is not expressly forbidden by some statute, or which would not be declared illegal by some court of justice, if the legality of such association came in question before it.

In some cases the state has aided in the formation of such associations, and has given them greater security for carrying their purposes into effect, as in the case of savings' banks and friendly societies. Sometimes the state grants a charter of incorporation to associations, which enables the body to transact its business more conveniently. Sometimes the state perceives that it can extract some revenue from persons who associate for particular purposes, as in the case of fire-insurance offices, for all persons who insure their property in them (except farming stock, &c.) must pay the state 200 per cent. on the sum which they pay to secure their property against the accidents of fire. If a man should think it prudent to invest a part of his annual savings in a life insurance, the state makes him pay a tax on the policy. A great many associations of individuals for benevolent, scientific, and such like purposes are left to direct their associations according to the common principles of law. Associations are much obstructed, when they do not possess a corporate character, that is, when they are not an artificial person. The use of this artificial person is solely for the purposes of holding property, and doing all necessary acts with respect to it, as making contracts, suing, and being sued; and under proper regulations all societies should have the power of acting as artificial persons. [CORPORATION.]

SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE. The object of this Society, as expressed in their address to the public, is 'to promote the arts, manufactures, and commerce of this kingdom, by giving honorary or pecuniary rewards, as may be best adapted to the case, for the communication to the Society, and through the Society to the public, of all such useful inventions, discoveries, and improvements as tend to that purpose.' It was projected in the year 1753; but the first public meeting took place in March, 1754. The plan was formed by Mr. William Shipley, a drawing-master, who acted for some time as secretary to the Society; and it was carried into effect by a few noblemen and gentlemen, among whom appear the names of Lord Folkstone, Lord Romney, and Dr. Stephen Hales. The services of Mr. Shipley were acknowledged by the Society voting to him, in 1758, a gold medal, 'for his public spirit, which gave rise to the Society;' and subsequently by the publication of his portrait as a frontispiece to the fourth volume of their 'Transactions.' The Society began, immediately after its formation, to advertise premiums for the encouragement of young persons of both sexes in the various departments of the fine arts; for improvements in agriculture and manufactures; for mechanical inventions; and for promoting the cultivation of valuable plants in British colonies.

For several years after the formation of the Society of Arts, there was no authorised publication of the papers communicated to the committees, or for making known the results of its labours. The publication of such information in an annual volume of 'Transactions' was contemplated soon after the commencement of the Society's operations; but the first volume did not appear until the year 1783. Many of the papers

however, which would otherwise have appeared in such a work, were published, with the sanction of the Society, in Dossie's 'Memoirs of Agriculture and other Œconomical Arts,' of which the first volume appeared in 1768, and the third and last in 1782. Some further particulars respecting the early proceedings of the Society are supplied by a 'Register of the Premiums and Bounties given by the Society instituted in London for the Encouragement of Arts, Manufactures, and Commerce, from the original institution in the year 1754 to the year 1776 inclusive.' This register, which was prepared by a committee of the Society, and is arranged in a tabular form, was printed in folio, in 1778. From it, and from a brief history of the transactions of the Society, published in the first volume of Dossie's 'Memoirs,' the history of the early proceedings of the Society must be derived. It is much to be regretted that there are no published statements from which the account can be readily continued to the present time.

The total amount of pecuniary rewards bestowed by the Society down to 1776 was, according to the 'Register' above referred to, 23,551*l.* 18*s.* 2*d.*; or, including the cost of medals and pallets, 24,616*l.* 4*s.* 8*d.* This register was continued by manuscript additions to the end of 1813; and from the unpublished part, with a sight of which the secretary has favoured the writer, it appears that the pecuniary rewards bestowed from 1777 to 1813 amounted to about 2757*l.* 10*s.*, and that the medals and pallets distributed were 188 in gold and 464 in silver. Later than this there does not appear to be any condensed statement of the operations of the Society; but it has been stated for some years past, in their advertisement to the public, that upwards of 100,000*l.*, derived from voluntary subscriptions and legacies, has been expended in pursuance of their plan. It may be briefly remarked, in the words of the secretary's address at the distribution of prizes in 1841, that 'at a time when it stood alone in offering encouragement to the fine arts, it effected much good in that department; and that it can now point with proud satisfaction to the names of Bacon, Nollekens, and Flaxman, Cosway and Lawrence, Sharp and Sherwin, Pingo, Marchant, and Wyon, with many other eminent artists, the early manifestations of whose genius were noticed by the Society in a manner which, there can be no doubt, assisted very materially in its development.' Still more important perhaps have been the effects of the Society's encouragement of poor operatives, in improving the processes with which they are practically acquainted. The history of those inventions connected with weaving, which have been the objects of their encouragement within the last forty years, was adverted to in the address just quoted, as an illustration of what the Society have effected; about twenty pecuniary rewards having been given, chiefly to Bethnal Green and Spitalfields weavers, for inventions of great utility.

As before stated, the first volume of the Society's 'Transactions' was published in 1783. For forty-seven years from that time a volume appeared annually; but since 1829 the volumes have been biennial. An index to the first twenty-five volumes was published in 1808, and two others, embracing respectively from the twenty-sixth to the fortieth, and from the forty-first to the fiftieth, have since appeared. In 1774 the Society removed from their original premises, opposite Beaufort Buildings, Strand, to their present house in the Adelphi, which was erected purposely for them; and in the years 1777-83 Barry decorated their great room with a series of pictures.

SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE. In the month of November, 1826, Mr. Brougham convened a meeting of gentlemen, who formed themselves into a committee for promoting the composition, publication, and distribution of elementary works upon all branches of useful knowledge. The two main objects in view were to give the people books which might convey knowledge to uneducated persons, or persons imperfectly educated, and to reduce the price of scientific and other useful works to the community generally. The committee then founded a society, under the name of The Society for the Diffusion of Useful Knowledge, composed of donors of 10*l.* and annual subscribers of 1*l.* The average income arising from annual and life subscription in each of the first five years was 300*l.*, from which one-half is to be deducted for works given to subscribers. From that time the subscriptions gradually diminished; indeed the pecuniary support of the Society was after the first year derived almost entirely from the sale of its works.

In the year 1832 the Society was incorporated by a charter, which vested in the London committee the whole of its property, and gave them the control over its proceedings. The London committee consisted of a chairman, of a vice-chairman, and a treasurer, elected annually, and sixty members, who held their seats until forfeited by neglect of the duties prescribed by the bye-laws of the Society. Mr. (now Lord) Brougham was the chairman of the Society from its commencement.

The revenue which the Society derived from its works was usually a rent paid by the publisher for the use of the copyright, proportionate to the cost and price of the work, and the number of the edition.

The Society published or superintended the publication of the following works:—1. 'The Library of Useful Knowledge,' consisting of a series of treatises on various branches of knowledge, as pure mathematics, physics, history, biography, and geography. These treatises comprehend nearly the whole of the sciences taught, reaching to their most abstruse parts; treatises on each branch of physics were also published, adapted to the conveyance of instruction in the most elementary and popular form. There are for example treatises teaching as much of natural philosophy as can be conveyed without a knowledge of mathematical science. Three hundred and sixty numbers of this series were published. 2. 'The Farmer's Series,' consisting of works on

the horse, on various kinds of cattle, on planting, on farms, on farm implements, and other agricultural subjects. 3. 'The Library of Entertaining Knowledge,' which consists of 43 volumes, largely illustrated, relating to history and biography, arts and antiquities, descriptive geography, and natural history, treated in a popular manner. 4. 'The Journal of Education,' 10 vols. 5. 'The Penny Magazine,' 14 vols. 6. 'The Penny Cyclopædia,' 27 vols. and 2 vols. of Supplement. 7. A series of Maps, consisting of nearly 200 maps and plans of great cities: these maps are founded on the best and most recent authorities, and were prepared under the superintendence of the Society. 8. Maps of the Heavens. 9. 'The Gallery of Portraits,' containing engraved likenesses of eminent men, from original portraits or other good authorities, with memoirs, in 7 vols. 10. British Almanac and Companion. 11. 'The Working Man's Companion.' 12. 'The Library for the Young.' 13. 'The Statistics of Great Britain.' 14. 'A Treatise on Friendly Societies;' 'A Treatise on Annuities;' 'A Manual for Mechanics' Institutions, and a Report of the Condition and Prospects of these Institutions.' 15. A series of Treatises on Governments. 16. 'Tables of Logarithms,' and Barlow's 'Tables of Squares, Cubes, &c.' From the profit of some of these works the Society derived a considerable income, which it devoted to the preparation of others, tending either to the advancement of science or to the moral or physical improvement of the people. The Society still exists under its charter, but it has ceased to be connected with any publications.

SOCIETY ISLANDS, the name given by Captain Cook, in honour of the Royal Society of London, to a cluster of islands in the South Pacific Ocean. They lie about 70 miles westward of another cluster, of which Tahiti (Otaheite) is the chief, named the Georgian Islands, in honour of George III. Mariners usually call the latter the Windward Islands and the former the Leeward Islands. Recent geographers have been disposed to comprehend both the clusters under the name of Society Islands. The following are the names and positions of these islands.

	S. Lat.	W. long.
Maitea	17° 53′	148° 10′
Otaheite, north point	17° 29′	149° 33′
Eimeo	17° 30′	150° 0′
Maiaoiti	17° 28′	150° 40′
Tetuaroa		
Huahine	16° 43′	151° 7′
Raiatea	16° 46′	151° 39′
Tahaa		
Bolabola	16° 27′	151° 53′
Mauarua	16° 10′	152° 30′
Tubai		
Lord Howe's Island	16° 46′	154° 13′
Scilly Island	16° 28′	155° 25′

The first five are those called the Georgian Islands, and the rest the Society Islands, when the two groups are distinguished. The list is exclusive of several islets which surround or are interspersed among these.

Of all these islands, Otaheite, or Tahiti, is by much the largest and the most elevated. All the islands are mountainous in the interior, and have a border from one to four miles wide, of rich level land, extending from the base of the high land to the sea; and although the outline of each has some peculiarity distinguishing it from the rest, in their general appearance they resemble each other. Tetuaroa, Tubai, Lord Howe's Island, and Scilly Island however form exceptions, as they are low coral islands, seldom rising many feet above the sea. Otaheite is 108 miles in circumference; Eimeo is supposed to be about 25 miles; Huahine probably more than 30; and Raiatea is somewhat larger. The others are of smaller extent. A corresponding resemblance prevails in the geological structure of the principal clusters and surrounding islands, the component substances being the same in all, although each has some distinguishing peculiarity of its own. There seems no reason to suppose that any of these islands are of altogether volcanic origin, like the Sandwich Islands, though they contain basalt, whinstone, and earthy lava. All the Society Islands are surrounded by a belt of coral rock, from two or three to twenty yards in width, and situated at distances from a few yards to perhaps two miles from the shore; these reefs protect the shores from the action of the rolling waves. The soil is various. The sides of the mountains are frequently covered with a thin layer of light earth; but the summits of many of the inferior hills present a thick stratum of stiff red ochre or yellow marl. The level tracts along the coast are the most valuable parts of the land. The soil of those tracts is a rich alluvial deposit, with a considerable mixture of vegetable mould, and is exceedingly prolific.

The climate, products, character, and condition of the inhabitants are the same as those of Tahiti, the principal island. [OTAHEITE.]

The Society Islanders are generally above the middle stature, but their limbs are much less muscular and firm than those of the Sandwich Islanders. The prevailing complexion is an olive, a bronze, or a reddish brown. Christianity has been generally adopted, and the population is increasing. It is estimated at somewhat over 20,000. Most of the natives can now read and write. Numerous vessels of from 30 to 80 tons burden are employed in trade, and in maintaining an intercourse between the several islands. A press has for many years been employed in supplying the natives with publications in their own language, suited to their wants and their condition. In 1843 the French sent a strong force to attack the Queen of Otaheite, and after a contest of some duration, they reduced her to submission, and took possession of the country in the name of the King of the French.

SOCINIANS. [SOCINUS; UNITARIANS.]

SOCI'NUS, FAUSTUS. The Socini were an ancient family of Siena, several members of which became distinguished in law and jurisprudence.

Laelius, the uncle of Faustus Socinus, was born at Siena in 1525. He was brought up to the law; but he turned his thoughts to the study of the Scripture, for which he was qualified by his knowledge of the Greek and Hebrew languages,

and, it is said, the Arabic also. Having detected, as he supposed, various errors in the doctrines of the Roman church, he left Italy in 1547, and finally settled at Zürich, where he died in 1562. His nephew Faustus, who then happened to be at Lyon in France, succeeded in getting possession of his papers.

Faustus Socinus, the son of Alexander Socinus, was born at Siena, Dec., 1539. His parents died young, and his education was somewhat neglected. At the age of twenty he took refuge in France, on account of danger which threatened his family on a suspicion of heresy. On the death of his uncle Laelius he returned to Italy; and being taken into the service of the grand-duke of Tuscany, spent twelve years at the court of Florence. In 1574 he retired to Basel to study theology. About 1578 he was invited into Transylvania by George Blandrata, a person of great influence in that country, to oppose the opinions of Franciscus Davidis on the power of Christ and the honour due to him. The two theologians lodged together in the same house for four months, but Davidis could not be prevailed upon to change his opinions; and as he still continued to proclaim them publicly, he was put in prison by the prince of Transylvania, where he ended his life.

In 1579 Socinus visited Poland, and wished to be received among the Unitarians of that country; but as he dissented from them in some matters, his application was at first rejected. Socinus however wrote in defence of the Polish Unitarian churches; and he also published his treatise, entitled 'Pro Racoviensibus Responsio,' in reply to the work of Jacobus Palæologus, which was entitled 'Defensio Veræ Sententiæ de Magistratu Politico.' The 'Responsio' was represented to Stephen Bathory, king of Poland, as a work against government, a mistaken charge. Socinus however thought it prudent to retire from Cracow, where he had lived four years, to the estate of a nobleman named Christopher Morsztyn. During this retreat he married the daughter of his protector, which greatly contributed to the influence that he subsequently obtained. His wife died in 1587, and he subsequently returned to Cracow. Socinus was now beginning to gain over many persons of rank to his opinions. It was during the second residence of Socinus at Cracow, and in 1598, after the publication of his book 'De Jesu Christo Servatore,' that the rabble pulled him from his sick chamber, and dragged him half naked through the streets. His property was plundered, and his manuscripts were destroyed, one of which was against atheists. After this outrage he left Cracow for a neighbouring village, where he died in March, 1604.

Antitrinitarian opinions had been promulgated at an earlier period, but it was Faustus Socinus who gave them a definite form, and reduced them to a system. He did not form a catechism, though he designed one; but this was effected by Smalcius and Hieronymus Moskorzewski, who collected and digested the doctrines which were established or approved by Faustus Socinus. This catechism was published at Rakow in 1605, in the Polish language. It was translated into Latin in 1609, and an English translation appeared at Amsterdam in 1652. In 1819 the Rev. Thomas Rees published a new English translation, with an historical notice.

The works of Socinus are in Latin, and fill the first two folio volumes of the 'Bibliotheca Fratrum Polonorum quos Unitarios vocant,' Irenepoli, 1656.

SO'COTRA is an island in the Indian Ocean, situated about 200 miles from Cape Guardafui, the most eastern point of Africa. It lies between 12° 16′ and 12° 45′ N. lat., and between 53° 25′ and 57° 34′ E. long., and extends about 70 miles from west to east, with an average width of 15 miles. The area is 1100 square miles.

Socotra consists of an elevated table-land, which occupies about four-fifths of the surface, and two plains, which lie south and north of the table-land. The general elevation of the table-land is between 700 and 800 feet above the level of the sea. Its surface is in many parts level for a considerable extent; many hills are dispersed over it, but they rarely constitute ridges. On the more level parts of the table-land there are many wide depressions, which generally extend south and north, and form long valleys. The table-land descends to the plains generally with a steep declivity, but in a few places it comes close to the sea, as at Ras (Cape) Shuab, the western extremity of the island, and at Ras Kattany: near Ras Feling, on the southern coast, the cliffs skirt the shores for eight miles.

The plain, which skirts the southern base of the table-land, is from two to three miles wide, and nearly level, but it is as arid and barren as the worst part of Arabia. The northern plain varies in width between two and four miles. It is not so low as the southern, nor so level, the surface being intersected by flat valleys in many places, and in others some masses of hills rise from 300 to 600 feet. The western part of this plain is adapted to pasturage, and the eastern to agriculture. With the exception of a few rivulets, none of the streams contain water all the year round. Hence the inhabitants are obliged to collect rain-water in reservoirs, but in most parts of the northern plain water is found at a distance of from eight to ten feet below the surface. The climate is sultry.

The principal commercial products are derived from the aloe and dragon's-blood-tree. The aloe plant (*Aloe spicata* or *Aloe Socotrina*) in the western districts covers the hills for many miles, at an elevation of from 500 to 2000 feet above the plains. The dragon's-blood-tree grows in the same part of the island, at an elevation of from 800 to 2000 feet. There are several forest-trees, but none fit for timber. Yams, wild orange trees, and dates are met with. Agriculture is limited to the cultivation of a species of millet, beans, and tobacco, with a little cotton and indigo.

There are no horses. The camel is the only animal of burden, and is nearly as sure-footed as the mule; but they are few in number, as are likewise cows and asses. Sheep and goats are numerous, especially in the western districts, where they constitute the principal wealth of the inhabitants. There are civet-cats all over the

island, rats, *mice*, and chameleons. There are several kinds of vultures, and also the flamingo. Turtles are found on the southern coast. Fish abound on several parts of the coast, and some families live on the produce of their fishing.

The population is estimated by Wellsted at 4000 individuals, which, considering the large tracts consisting nearly of bare rocks, seems to be a very fair estimate. It consists of two different nations, of which one is foreign and the other apparently aboriginal. The former are called Socotran Arabs, and the latter Bedouins. The Arabs are a mongrel race, made up of many casual settlers; but the aboriginal Bedouins, who are so called in consequence of their wandering life, differ from them in language and in personal characteristics. They are tall, with strong, muscular, and remarkably well-formed limbs; a facial angle like that of Europeans, the nose slightly aquiline, the eyes lively and expressive, and the mouth well-formed. Their hair curls naturally, but does not approach to a woolly or crisp texture. Their general complexion is fair, but a few of them are as dark as the Hindoos. They are Mohammedans, but more tolerant than the Arabs.

There is no place which can be called a town. The capital is Tamarida, which is built not far from the northern shores, and consists of about 150 straggling houses.

Socotra was known to Ptolemæus and to Arrian. It was visited by the Portuguese Fernandez Perara in 1504, and taken possession of by Albuquerque in 1507. It is not known at what time the Portuguese evacuated the island, but probably before the 16th century elapsed. It then returned under the sway of the sultan of Kisseen on the southern coasts of Arabia, under whom it is still nominally dependent.

SO'CRATES was born at Athens in B.C. 468. His father, Sophroniscus, was a sculptor; his mother, Phænárete, a midwife. He was originally destined for his father's profession, and we are told that he made no slight proficiency in his art. He did not however devote himself to this profession; he carried it on so far as to earn a decent subsistence from it, but as he inherited some little property on his father's death, he devoted the greater part of his time to philosophy. He spent a great part of his time in reading all the works of former and contemporary philosophers. Crito supplied him with money to pay the masters who taught various accomplishments at Athens, and he became a hearer of most of the great philosophers who visited Athens during his time, especially of Anaxágoras, his successor Archeláus, and the luxurious and accomplished Pródicus. He also served his country faithfully as a soldier, according to the duty of all Athenian citizens. During the Peloponnesian war he made three several campaigns. In the first of these he took a part in the long blockade of Potidæa, during which he saved the life of Alcibiades. The scene of his second campaign was Bœotia, where he fought for his country in the disastrous battle of Delium. Here he saved the life of another of his pupils, Xenophon, whom he carried from the field on his shoulders. On his third campaign he served at Amphípolis. As a member of the deliberative senate (βουλή), he showed great firmness in voting against the iniquitous sentence by which the victors of Arginúsæ were condemned to death. He did not leave Athens even when the tyranny of the Thirty had reached its height; he was employed by them as an agent in one of the most detestable murders which they perpetrated—that of Leon; and though he did not actually assist in seizing the fugitive, his reluctance to do so arose probably from a goodness of heart quite consistent with a general adherence to the party which had selected him as their instrument. That Socrates was not well-disposed to the democratic constitution of his country is proved, to a certain extent, by the fact that the indictment on which he was condemned and executed was brought forward by Anytus, one of the chief of those citizens who assisted Thrasybúlus in restoring the old state of things. An opinion generally unfavourable to him had for a long time been prevalent in Athens, and this opinion was, in part at least, supported by Aristophanes, who introduced Socrates into his celebrated comedy, 'The Clouds,' as a mischievous speculator on matters of religion, and as a corruptor of the youth of Athens—as, in fact, one of the class of Sophists. Although there can be no doubt that the comedy just mentioned had no share in producing the condemnation of Socrates, it is at least remarkable that the two principal charges brought against him on his trial constitute the leading features in the satirical censure of Aristophanes. The accusers, Meletus, Anytus, and Lycon, state their charges as follows: 'Socrates is guilty of impiety in not acknowledging the gods acknowledged by the state, but on the contrary, introducing new deities; and he also does wrong in corrupting the youth.' Xenophon seeks to justify his master from these charges, on which a small majority of judges pronounced him guilty. On being called up to receive his sentence, he treated the court with a contumelious disdain, and he was sentenced to death by a much larger number than those who had voted him guilty. The festival of the Theóra gained him a reprieve of thirty days, during which his friend Crito would have provided for him the means of escaping from prison, but he would not avail himself of the opportunity. His sentence was carried into execution by his taking a cup of hemlock at the end of the month Thargelion (B.C. 399). He met his fate with calmness and resolution, in the conviction that there is another life after this.

Socrates is the chief interlocutor in those wonderful dialogues of Plato, and though he never committed any of his own thoughts to writing, he has left indisputable traces of the important innovations in science of which he must be considered as the author. We have three authorities for the doctrines of Socrates: Xenophon's 'Memorabilia;' the 'Dialogues' of Plato; and the 'Strictures' of Aristotle. Xenophon is the apologist of Socrates; and, independent of this, he may be considered as having only exhibited the practical part of his doctrines, which however some people may consider to be the best part.

As to Plato, the Socrates whom he represents with such dramatic truth appears to have been the philosophical, as he is the formal, basis of all that Plato has done for science. Aristotle tells us that Socrates philosophised about virtue, and made some real discoveries with regard to the first principles of science; and this is the philosophical basis which we discern in the Socrates of Plato. We find him always endeavouring to reduce things to their elements, stripping realities of their pompous garb of words, and striving to arrive at truth; and we also find that his philosophy is generally applied to ethics. With him the scientific and the moral run into one another, for knowledge is the final cause of the will, and good is the final cause of knowledge; hence he who knows what justice is must needs be just, since no one wittingly departs from that which he knows to be good. Socrates considered it to be his particular vocation to arouse the idea of science in the minds of men. This is clear from the manner in which he is said to have insisted upon the consciousness of ignorance, which consciousness however was not the limit of his philosophy, but only the preliminary to the attaining to true knowledge. His antagonistic opposition to the Sophists shows this. They professed to know everything, without having the idea of science, or knowledge of what knowledge is; and as he had that idea without the mass of acquirements on which they prided themselves, he was naturally their opponent, and his strife with them is carried on entirely in this way, that he endeavours to *nullify* the effects of their acquired knowledge by shifting the ground from the objects to the idea of science, whereby he generally succeeds in proving their deficiency in the one thing needful to the philosopher. The irony of Socrates has been well described as the co-existence of the idea of science in him, with the want of clear and complete views on any objects of science—in a word, as the knowledge of his ignorance. With this is intimately connected the indirect dialogical method which he invariably adopted, and which may be considered as his method of extracting scientific truth from the mass of semblances and contradictions by which it was surrounded. His *dæmonion*, or secret monitor, seems to have been little more than a name which he gave to those convictions on practical subjects which sprung up spontaneously in his mind, and for which he could not find any satisfactory means of accounting, though he felt himself constrained to follow in the course which they prescribed.

In person, Socrates was no less singular than he was in manners and dress. He had large projecting eyes, a sunken nose turned up at the end, with wide dilated nostrils, and a great unwieldy belly.

SO'CRATES, the ecclesiastical historian, was born at Constantinople towards the end of the fourth century. He appears to have abandoned the profession of advocate in order to devote himself to the study of ecclesiastical history. He is generally considered the most exact and judicious, as well as the most original, of the three continuators of the 'Ecclesiastical History' of Eusebius. He is more careful in his statements than Sozomen, and less credulous than Theodoret. His History extends from the year 306 to 439; it has been abridged by Epiphanius in his 'Historia Tripartita,' and was published for the first time as a continuation of Eusebius by Robert Stephens, Paris, 1544, in fol. There is a good French translation of it by the President Cousin.

Though the most exact of the continuators of Eusebius, he has nevertheless allowed himself to fall into error on several important points. His account of church discipline has been severely criticised by Baronius, Fleury, and other Roman Catholic writers; but he has on this point been very ably defended by Cousin in the preface of the translation to his History. He is suspected of a leaning in favour of the schism of the Novatians, though he shows but little knowledge on the subject. The date of his death is not ascertained.

SODA. [SODIUM.]

SODA ALUM occurs in white fibrous masses, the outer fibres opaque by decomposition, internally transparent and exhibiting a glossy or silky aspect. Not scratched by the nail. Specific gravity 1.88. Found at St. Juan, in South America. Analysis:—Sulphuric acid, 38.5; alumina, 12.0; soda, 7.5; water, 42.0; with a little silica, lime, iron, and manganese.

SODA'DA has been named from *sodad*, the Arabic name of a shrub found in Egypt, as well as everywhere in the province of Yemen in Arabia. It requires mention only as the unripe fruit is cooked and forms an article of diet among the Arabs.

SODALITE occurs crystallized and massive. The primary form of the crystal is a cube; it is hard, grayish, and translucent. It consists chiefly of silica, soda, and alumina.

SO'DIUM, a metal, the base of the alkalis soda, natron, and the fossil alkali, in which substances it is combined with oxygen, forming the protoxide of the metal. It was discovered by Sir H. Davy in 1807.

The properties of sodium are such as to prevent its occurrence in nature, except in combination, on account of its intense affinity for oxygen. Immense quantities occur combined with chlorine, forming common salt; and a considerable quantity is met with in the state of oxide, or soda, combined with carbonic acid: these are its principal sources. It has a colour and lustre resembling those of silver. It remains a soft solid at 32°, so that small portions may be welded together by pressure; it becomes much softer at 122°, fuses at about 190°, and by a white heat is volatilized. Like potassium, it speedily tarnishes by exposure to the air, owing to its great affinity for oxygen, and this occurs more rapidly when the air is moist. When thrown on water it decomposes it with a hissing noise, the results being hydrogen and oxide of sodium, or soda. When however it is placed on a moistened bad conductor of heat, as charcoal, it decomposes water with vivid combustion. Its specific gravity is 0.972, so that although it is considerably more dense than potassium, it is yet less so than water. It is a good conductor of electricity and heat; but if too

strongly heated in the air, it burns with a yellow flame.

Oxygen and *Sodium* form two compounds, protoxide and peroxide of sodium. The *protoxide* (S^1O^1) is pure *soda;* it is a gray solid, resembling potash in appearance, but it is less fusible and volatile. It is extremely acrid to the taste, and is very caustic. It has a great affinity for water, dissolving readily in it, and in large quantity, and the solution has strongly marked alkaline properties. The *hydrated* protoxide (S^1 Water^1) is a solid white substance greatly resembling soda in appearance and properties. The *peroxide* (S^1O^2) is of a yellowish-green colour. *Chlorine* and *Sodium* form only one compound (S^1 Chl^1), common salt, formerly called Muriate of Soda, and now Chloride of Sodium. Of all natural soluble salts this occurs in the greatest quantity. It is met with solid, constituting rock-salt, in solution in salt springs and in the ocean, and in small quantity in almost all spring and river water. Sodium forms compounds with *Fluorine, Iodine, Bromine, Sulphur, Phosphorus,* &c.; but they are not important.

The oxide of sodium forms numerous salts with the acids, of which the following are the chief:—

Nitrate of Soda (S^1 Acid^1) has a cooling saline taste, is inodorous and colourless; in a moist atmosphere it deliquesces; it readily crystallises, and the form of the crystal is an obtuse rhomboid; so obtuse indeed, and so near a cube, that the salt was originally called Cubic Nitre, to distinguish it from potash nitre, the crystals of which are prismatic. It deflagrates with charcoal but, owing to its property of attracting moisture, it cannot be used in the manufacture of gunpowder. It is however used largely in making nitric acid and sulphuric acid.

There are three compounds of carbonic acid and soda, the carbonate, sesqui-carbonate, and bi-carbonate. The *carbonate,* formerly called *subcarbonate of soda,* was obtained from barilla [BARILLA] or kelp [KELP]: the former being the ashes of the *Salsola soda,* and prepared in Spain; the latter the ashes of burnt sea-weed, manufactured in Scotland. Since the duty has been taken off common salt, carbonate of soda is now prepared, for the numerous uses to which it is applied, by first converting common salt into sulphate of soda by means of sulphuric acid, and then treating the sulphate with small-coal and chalk in a reverberatory furnace: the result is a mixture of carbonate of soda and sulphuret or perhaps oxi-sulphuret of calcium; and when this is treated with cold water, the sulphuret remains undissolved, while the carbonate of soda is taken up by the water, and by evaporation to dryness what is called *soda ash* is obtained; while by due evaporation crystallised carbonate of soda is formed. The pure carbonate (S^1 Acid^1) is a colourless inodorous powder; it is devoid of smell, but has a disagreeable taste; it is readily soluble in water; does not deliquesce when exposed to the air. The primary form of this substance, when crystallised by moderate evaporation of the solution, is an oblique rhombic prism. At high temperatures the salt becomes fluid and boils. Water at 60° dissolves half its weight of carbonate of soda, and boiling water considerably more. The *Sesqui-Carbonate* (S^2 Acid^3 Water^4) is found native in Hungary, and also near Fezzan in Africa; it occurs in hard striated crystalline masses, and it is not altered by exposure to the air, but is readily soluble in water. Its taste is less alkaline than that of the carbonate, into which it is converted, when strongly heated, by losing one-third of its carbonic acid. The *Bi-Carbonate* (S^1 Acid^2 Water^1) has a very slightly alkaline taste. It requires about twelve times its weight of water for solution. When the solution is boiled, it loses one-fourth of its carbonic acid, and is converted into sesqui-carbonate; at a red heat it loses all its water and half its carbonic acid, and is then carbonate of soda. It is used in medicine. This salt dissolved in water is called *Soda-Water,* when an additional quantity of carbonic acid has been forcibly combined with it.

Sulphate of Soda, formerly called *Glauber's Salt,* is readily soluble in water, and the solution by evaporation yields colourless transparent prismatic crystals, the primary form of which is an oblique rhombic prism. It has a very bitter taste; it effloresces when exposed to the air, by losing water of crystallisation. Boiling water dissolves its own weight of this salt, and water at 60° one-third of its weight.

The *Phosphate, Borate,* and other salts of soda, are less important than the above.

SODIUM, *Medical Properties of the Preparations of.* This, when in the state of an oxide, is termed the mineral alkali, in contradistinction to potash, or the vegetable alkali; both however are found in plants, though the former exists in large quantity only in plants growing in the sea, on the sea-coast, or inland salt marshes. In the form of the chloride of sodium, common or table salt, it is one of the most abundant principles in the mineral kingdom. It also exists in many fluids in the animal kingdom, such as the blood and urine, particularly in man. It possesses the ordinary qualities of a fixed alkali, but, notwithstanding the resemblance it has to potash, the preparations, even with the same acid, present some differences which may be here pointed out.

In the oxidised state, or soda (pure or caustic), it is neither employed in medicine nor in surgery. It is only when in combination with carbonic acid that it is used to correct acidity. It exists in three states, viz. carbonate, sesqui-carbonate, and bi-carbonate: the causticity of these is less in proportion to the increase of the acid. These preparations, administered in various ways, but chiefly in solution, are much used to counteract real or presumed acidity of the stomach.

The preparations of soda possessed of purgative properties are—the sulphate, or Glauber's Salts, the phosphate, and the triple salt, called Sodæ-Potassio-Tartras, or Rochelle Salts, of which potash is also a constituent.

The preparations of soda possessed of diuretic properties are the bi-borate [BORAX] and acetate. The acetate is rarely used, though from not deliquescing, it has the advantage over acetate of potash that it can be administered in the form of powder.

SODOM, an ancient city of Palestine, which, with Gomorrah, Admah, Zeboim, and Bela or Zoar, formed the five 'cities of the plain,' four of which were destroyed by fire from heaven for the wickedness and vices of their inhabitants, in the time of Abraham. (Gen. xix.)

It has usually been assumed that the Dead Sea has existed only since the destruction of Sodom and the other cities; but from the discoveries of Dr. Robinson, we learn that this could not have been the case, at least not within any historical period. Nevertheless it is concluded that the lake then covered a considerably less extent of surface than at present; and that Sodom and the other cities stood on what forms now the southern portion of the lake, which portion is even now sufficiently distinguished from the main body of that water.

SOEUR, LE, HUBERT. This excellent sculptor, a Frenchman by birth, according to Walpole, was the pupil of the celebrated John of Bologna. He came to England probably shortly before 1630, when he must have been about fifty years of age. In 1633 he was employed by the family of Howard-Arundel to cast the well-known equestrian statue of Charles I. at Charing Cross. Not being put up before the commencement of the great civil war, it was sold by the Parliament to a brazier named John Rivet, who had orders to break it into pieces. Rivet however buried it, and it remained concealed until the restoration. It was placed in its present situation at the expense of the crown, about 1678. The pedestal was executed by Grinling Gibbons. Le Soeur executed many other bronze or brass works in England, but they are now all lost or destroyed.

SOFA'LA is a country on the east coast of Africa, extending from Cape Corrientes (25° S. lat.) to the vicinity of the river Luabo, the most southern arm of the Zambesi (19° S. lat.). This country, together with the province of Senna, was formerly known by the name of Monomotapa, and was noted for the quantity of gold which was supposed to exist there. At present the name of Monomotapa is antiquated, and the few gold-mines which exist are included in the province of Senna.

The coast is low, and so beset with shoals and sandbanks, that it is very difficult of access. Along the coast are several islands, as the Bazaruta Islands, and Chuluwan, which is 16 miles long, and nearly divided into two parts by a salt creek opening into the small channel that separates it from the mainland.

The mouths of several rivers have been visited. The most northern is the Boozy, or Jarra, which falls into a large shallow bay called Massangzany. Then follows the Sofala, forming at its mouth a tolerable harbour, which however is very difficult of access on account of the bar. Farther south is the Savey, or Sabia, and then the Sawooro, which falls into the great bay of Maroonone. These two rivers are hardly navigable for boats at their entrance, but are stated to be large rivers in the interior. The most southern river is Inhamban, which is easy of access, and makes a superb harbour, but is scarcely navigable for ships beyond the town, eight miles from the entrance; and five miles farther up it is not navigable even for boats.

Ivory and bees'-wax constitute the principal if not the only articles of export; they are sent to Mozambique. The native tribes are warlike. They use spears, and shields made of hide. They are divided into numerous tribes, and their chiefs come annually to the Portuguese settlements, where they receive some trifling presents. The most northern of the Portuguese settlements is Sofala, which consists only of a fort and a few miserable mud huts. The most important settlement is Inhamban, which is a small trading town with tolerably good buildings.

SOFTNESS is a condition of solid bodies in which the particles are held together by a cohesive power of small intensity: in consequence of this, such bodies change their figures upon the application of a small degree of force; and they do not recover their previous forms upon its removal.

SOHAM. [CAMBRIDGESHIRE.]

SOIL. The composition of several varieties of soil, as ascertained by analysis, is stated in the article ARABLE LAND. There are however various modes of distinguishing soils, without entering into a minute analysis of their component parts. The simplest and most natural is to compare their texture, the size and form of the visible particles of which they are composed, and to trace the probable source of their original formation from the minerals which are found around or below them, or the rocks from which they may have been slowly separated by the action of the elements. The science of geology, which teaches the relative position and nature of the minerals of which the outer crust of the earth is formed, is consequently of great utility in aiding us to compare different soils and in ascertaining their composition.

The soils which are immediately derived from the primitive rocks consist either of visible fragments of quartz and other hard minerals, which are not affected by exposure to air or water, and are only ground and comminuted by being rubbed against each other in floods and torrents, or of minuter particles of the same, of which the shape is not readily distinguished by the naked eye. When they are altogether composed of visible particles and stones, the water readily passes through them; and unless they are kept continually moist by a regular irrigation, without any stagnation of the water, they are absolutely incapable of sustaining vegetation, or of bringing fruits to maturity. It is seldom however that any gravel or sand does not contain some portion of earth or other matter, of which the particles become invisible when diffused through water, and to which the expression impalpable substance may be applied. A certain portion of this finer part of the soil, and its due admixture with the coarser, especially where there is some regular gradation in size, and no stones of too large dimensions to obstruct the instruments of tillage, may be considered as essential to fertility. The chemical composition of the impalpable substance no doubt greatly affects the degree of fertility; but the general texture must be considered as by far the most important

circumstance. To improve this texture permanently is the great object of all the labours of the husbandman. For this purpose he carries various earths from one spot to another; puts clay upon one field, and lime and chalk upon another; brings peat to sands and clays, and carries gravel and lime to his peat-bogs. Without an adequate knowledge of the composition and texture of a soil, it is impossible to make permanent improvements with any certainty, or without incurring the risk of failure or of useless outlay.

The soils which have been formed from the disintegration and decomposition of the primitive rocks, such as granite, basalt, slate, or limestone, and especially those which contain all these minerals minutely divided and intimately mixed, are always naturally fertile, and soon enriched by cultivation. The hard particles of quartz maintain a certain porosity in the soil, which allows air and moisture to circulate, while the alumina prevents its too rapid evaporation or filtration.

The soils which have been evidently formed from the rocks which are supposed to be of secondary formation, are fertile according to the proportion of the earths of these rocks which they contain.

Argillaceous earth, or clay, exists in some proportion in almost every rock. Some of the hardest gems are chiefly composed of alumina. It has the property, when mixed with other substances, as silica or lime, of fusing into a stone of great hardness and insolubility. In this state its effect on the soil is not to be distinguished from that of silica; and by burning common clay, or clay mixed with carbonate of lime, a sandy substance is produced resembling burnt brick, which tends greatly to improve the texture of those clays which contain little or no sand in their composition. It must be remembered that the stiffest clays contain a large portion of silica in an impalpable state; but this, instead of correcting their impermeable and plastic nature, rather adds to it. It is only palpable sand which combined with clay in due proportion, and with a mixture of organic matter, forms the richest and most easily-cultivated soil. Some of the rocks of secondary formation contain a considerable portion of alumina and lime; and when these earths meet with crystallised sand, a compound, or rather a mixture is formed, which has all the requisite qualities as to texture, to produce the most fertile loams. The only deficiency is that of organic matter; but this is so readily accumulated wherever vegetation is established, or can be so easily added artificially, that these loams may always be looked upon as the most favourable soils for the usual agricultural operations; and if a considerable depth of loam is found, which neither retains water too long nor allows it to percolate too rapidly, it may be looked upon as a soil eminently capable of the highest degree of cultivation, and on which no judicious outlay of labour will ever cause loss or disappointment to the farmer.

The greensand which lies under the chalk, and appears near the surface in several parts of Britain, consists of silicious, argillaceous, and calcareous earth, intimately combined and in a high state of subdivision, and yet not forming a compact paste with water so as to dry in hard lumps, but having rather the loose appearance and granulation of fine sand, whence its name. On this soil are found the finest wheats; but such is the variety of its form as it approaches towards the chalk, or crystallised sand, or the plastic clay, that the soils which it forms have every degree of texture, from loose sands to stiff marls.

Chalk is perhaps the mineral most widely spread throughout Britain. [CHALK.]

The Weald Clay consists of very minute particles of alumina and silica, forming a tough unctuous earth, fit for the growth of oaks, with very few stones or visible particles. This soil is found in Sussex and Kent chiefly. This stubborn soil may be rendered fertile by tillage, draining, and exposure to frost in winter: and its tenacity may be corrected by the application of lime, ashes, and other substances, especially fresh stable-dung, which interpose and prevent the clods from reuniting into one tough impervious mass. Lime and chalk do this most effectually; and when the weald clay has been brought to a looser texture, it produces beans, wheat, oats, and clover, in great perfection.

As clay soils predominate in England, it is of great importance that it should be generally known that no soils repay the cost of improvement better than clays, provided the surface be such as to admit of perfect draining.

The Oxford Clay is of a bluish colour, which alters on exposure to the air. This clay is favourable to the growth of grass, and some of the richest pastures in Wiltshire and Oxfordshire have it for a subsoil. In the fens of Lincolnshire the Oxford Clay is covered by a coat of peat, formed by the decomposition of aquatic plants, which have accumulated wherever the water had no natural exit. When these fens were laid dry by an extensive system of draining, the peat was converted into a rich soil by the admixture of the clay which was found under it.

The Oolite Formation contains much carbonate of lime cemented by an unctuous earth into a species of stone. The soil which lies over this stone, and which is of nearly the same nature, but broken and disunited, is various in its qualities. Sometimes it is of great fertility, and sometimes nearly barren, according as the impalpable matter in it abounds and contains a due proportion of the different earths, or it resembles a loose chalky sand, in which moisture is retained with difficulty. In the first instance it produces every kind of grain in abundance with moderate cultivation. In the latter it requires a great outlay of manure, which readily disappears, and it is justly called a poor hungry soil.

On the Red Sandstone is found a soil which is usually of the finest quality. The fine loose soils of Devonshire and Somersetshire are of this description. It unites most of the requisites of a good soil in its texture, neither too close nor too loose, and in the impalpable matter in its composition. When it contains a proper portion of calcareous earth, it may be reckoned amongst the

most fertile soils; and where this is deficient, the addition of lime or chalk is the best means of improving it.

These are some of the principal natural soils found in Great Britain. Each distinct formation gives rise to a great variety with respect to fertility, even where the basis remains the same; but it is of great importance to the farmer to ascertain the general nature of the rocks and strata on which his farm is incumbent, and no chemical analysis can determine the exact value of the land, unless the geological situation of it is distinctly known. But with this guide the analysis may distinguish the varieties, and point out the spots which can be cultivated at the least expense, or improved by the simplest means; while it may also show the deficiencies which render a soil on the most favourable formations difficult of cultivation or improvement, when these deficiencies are not easily remedied for want of those substances which are not found within reach of the farm. In all these soils no notice has been taken of organic matter, because this seems not in any great degree to be connected with their formation. The Primary Strata are distinguished by having no traces of organic remains in their composition. The Secondary Strata have not a sufficient proportion to call for an especial notice of it. It is in the Tertiary Strata, especially those which have been formed by the destruction of animal and vegetable substances, that organic matter becomes a peculiar object of attention, and from this reason alone alluvial soils of later date are found highly fertile, whenever the circumstances which prevented their cultivation are removed; whether it be the waters which are to be shut out by dikes or carried off by draining, or a want of labourers which has left them to a state of nature, whenever the soil is turned up and the seed sown, the crops are always, for a greater or less period, certain and abundant.

The alluvial soils formed by the deposit of a variety of earths in a state of great division, and mixed with a considerable portion of organic matter, form by far the most productive lands. They will bear crop after crop with little or no additional manure, and with a very slight cultivation. These soils are found along the course of rivers which traverse extensive plains, and which have such a current as to keep very fine earth suspended by a gentle but constant agitation, but not sufficiently rapid to carry along with it coarse gravel or sand. Wherever there is an obstruction to the current and an eddy is formed, there the soil is deposited in the form of mud, and, gradually accumulating, forms those alluvial soils which are so remarkable for their fertility when carefully protected from the inroads of the waters. In these soils the impalpable matter greatly predominates; but the intimate mixture of the earths with organic matter, in that state in which it has been called *Humus*, prevents their consolidating into a stiff clay; and the gases which are continually evolved from the organic matter keep the pores open, and give scope to the growth as well as the nourishment of the roots. It is in the alluvial soils principally that an accurate analysis is useful; because the proportion of their constituent parts varies in innumerable degrees.

Organic matter is no doubt essential to great fertility in a soil, but some soils require more of it than others. Humus, which is the form which organic matter naturally comes to by slow decomposition in the earth, gives out certain elements which the roots can take up in their nascent state, and from which they obtain the carbon which is so abundant in all vegetable productions. But organic matter in every stage of its spontaneous decomposition keeps the pores of the soil open, and admits, if it does not even attract, air and moisture to the fibres of the roots. In all rich soils which have been long cultivated, especially in gardens, there are particles of a dark colour and fibrous texture, which in the microscope appear like minute logs of charred wood. These keep the soil open, and supply carbonic acid, when the air reaches them, or they are slowly transformed into humus, which remains inert as long as it cannot imbibe oxygen and form carbonic acid. Humus is no doubt one of the chief causes of fertility, but its presence does not appear to be so indispensable as has been imagined. A proper texture seems a much more indispensable condition. Whether humus be formed directly or by the slow process of vegetation and subsequent decomposition, does not readily appear; but it is certain that there are soils which are highly fertile in which scarcely a trace of humus can be discovered. Such are the soils which are produced by the decomposition of the lava which has run in a liquid state from the craters of volcanoes. When exposed for a time to the influence of the atmosphere, the lava crumbles into an earth, which is neither so loose as silicious sand nor so plastic as clay, and which has such a porosity as suits the growth of the roots of vegetables.

A good soil is composed of one-third coarse sand, one-third very fine sand, and one-third impalpable matter, in which there is silica in the greatest quantity, alumina and lime in a smaller, and from four to ten per cent. of organic matter, without any appearance of tannin.

The simplest process of ascertaining the mechanical texture of soils is by washing with pure water. For this purpose nothing is required but a few flat plates and large cups. Some of the soil is formed into a very thin mud by stirring it in a cup nearly full of water. The finer particles are successively poured off from the sand or grit, which at last remains pure, so that the water added to it is no longer discoloured. This being dried and weighed, gives the course sand. The water and earth poured off are allowed to settle. A common soup-plate is found a very convenient vessel for this purpose. On the surface of the deposited earth will be found all the undecomposed vegetable matter, which with a little care is easily taken off, dried, and weighed. The finer portions of the earth can be poured off successively by shaking the whole moderately, till nothing but very fine sand remains. The alumina and impalpable silica will remain long suspended in the water, and allow any sand yet remaining to be

deposited. They may be rapidly separated from the water by filtration through stout blotting-paper; but it is preferable to pour them into a glass tube about one inch in internal diameter, with a cork fitted in the lower end. In this tube the earths slowly fall to the bottom, and any variety in the size of the particles causes a line more or less distinct, which can be observed through the glass; and thus a very good idea may be obtained of the proportion of the different earths, as far as regards the size of their particles. In order to ascertain their chemical differences, they should be taken to a chemist and analysed.

SOIGNIES. [HAINAULT.]

SOISSONS. [AISNE.]

SOJA HI'SPIDA, *Dolichos Soja* (Linn.), a leguminous plant, a native of Japan and the Moluccas, and abundant in the peninsula of India, though probably introduced there. The seeds resemble those of the haricot, French, or kidney bean, and are used by the Chinese to form a favourite dish, which looks like curd, and which though insipid in itself, yet with proper seasoning is agreeable and wholesome. The Japanese put them into soup, of which they sometimes partake three times a day. They likewise prepare with them the sauce termed *Sooja*, which has been corrupted into *Soy*.

SOL. [SOLMISATION.]

SOLA, frequently *Shola*, is the name of a plant common in moist places, and in the rainy season in many parts of the plains of India. It belongs to the genus *Æschynomene*. The plants are remarkable for their light and spongy texture, and seem indeed to be composed almost entirely of pith.

SOLAN GOOSE. [BOOBY.]

SOLANA'CEÆ, a natural order of plants belonging to the dicarpous group of Monopetalous Exogens. This order is most closely allied to *Scrophulariaceæ*. The plants are natives of most parts of the world, without the arctic and antarctic circles, and especially within the tropics.

This order is one of the most important and interesting in its class, from its bringing together plants of the greatest utility, yet possessing apparently opposite properties. The Deadly Night-Shade, the esculent Potato, the pungent Capsicum, the mild Tomato, the wholesome Egg-Plant, and the poisonous Tobacco, are all found here. They will however, on close examination, be found to possess the same properties in a greater or less degree. Many of the plants of this order are used in medicine, amongst the most valuable of which are Henbane [HYOSCYAMUS], Deadly Night-Shade [ATROPA], Bitter-Sweet [SOLANUM], Stramonium [DATURA], and Tobacco [NICOTIANA]. The species of *Physalis* were formerly used in medicine, but are not now in repute in this country. *P. Alkekengi*, the common Winter Cherry, is grown as an ornamental plant; and in Arabia, and even in Germany and Spain, the berries are eaten as a dessert. *Lycium barbarum* is known in this country as Tea-Plant, and has been recommended as a substitute for the Chinese plant. The Calabash-Trees of the West Indies and the American continent are different species of *Crescentia*, which is often referred to this order. The fleshy pulp of the fruit of some is eaten, but in most species is deleterious. The most valuable part of the calabashes is their rind, which is tough, and it is applied by the negroes to a variety of purposes. Cups, mugs, bowls, basins, and saucepans are made from them, and in fact almost every other article of household use. Cayenne-Pepper [CAPSICUM] is the produce of this order.

SOLANDER, DANIEL CHARLES, was born in Nordland, in Sweden, where his father was a minister, Feb. 28, 1736. He studied at Upsal, under Linnæus, and took his degree of M.D. at that university. Having made a tour in Russia, he prepared to visit England, but the vessel of war in which he embarked was suddenly ordered to the Canary Isles, taking Solander far away from his destination. He however made great accessions to his knowledge of natural history whilst at the Canary Isles. Shortly after his arrival in England, October, 1760, he was employed at the British Museum, and was subsequently appointed one of the assistants in the natural history department. In 1764 he was elected a fellow of the Royal Society. In 1766 he published a catalogue of the fossils presented to the British Museum by Mr. Brander. In 1768 he accompanied Sir Joseph Banks when Sir Joseph went with Captain Cook in his first voyage round the world. They returned in 1771, laden with treasures, which are still in the British Museum. The University of Oxford soon after conferred on Solander the degree of Doctor of Laws. In 1773 he was appointed under-librarian at the British Museum. He died in 1782.

Dr. Solander published little with his name attached. Most of his productions are contained in the 'Philosophical Transactions,' and the 'Observations and Enquiries of a Society of Physicians.' Nevertheless his labours were by no means few or of little importance. He has left behind him a large mass of manuscripts, which are still existing in the British Museum, and afford abundant materials for the further prosecution of the subjects to which he devoted his attention.

SOLANDRA, a genus of plants of the natural family of *Solanaceæ*. The name has been applied to other genera, but is now restricted to a small Solanaceous genus, remarkable for the beauty and great size of the flowers of its species, which are natives of Mexico, Jamaica, and Brazil.

SOLANI'NA, an alkali existing in the Night-shade (*Solanum dulcamara*) and several other species of *Solanum*. It has been found also in the potato which has been allowed to germinate in the dark. Solanina changes by exposure to the air. It is inodorous, and has a nauseous acrid and somewhat bitter taste. The salts of Solanina have a disagreeable permanently acrid taste, and are poisonous. They are very soluble in water and in alcohol. The aqueous solution is precipitated by tincture of galls, and gives a yellow precipitate with chloride of platina. Solanina consists of hydrogen, 8.96; carbon, 58.67; oxygen, 30.73; nitrogen, 1.64.

SOLA'NUM, the name of one of the most extensive genera of plants, the type of the natural order *Solanaceæ*.

Upwards of 400 species of plants belonging to this genus have been enumerated, including many with apparently very opposite properties. The esculent Tomata, the Egg-Plant, and the Potato, with the various species of poisonous Nightshades, are found united so closely by botanical characters, that it is impossible generically to separate them. The properties of these plants however do not differ in kind, but in degree, and the berries and leaves, and even the tubers when uncooked, of the potato, possess in a mild degree the narcotic properties of the poisonous nightshades. Many of them have also very handsome flowers, and are much cultivated in our gardens and greenhouses.

S. tuberosum, the common Potato, is one of the plants for which we are entirely indebted to America. It is found native in the greatest abundance on the western coast of South America. [POTATO.] *S. nigrum*, Garden Night-Shade, is common in gardens, fields, and waste places in Great Britain. It has white flowers, producing small berries of a black colour. *S. dulcamara*, Woody Nightshade or Bitter-Sweet, is a native of Europe, Asia, and North America, in hedges and among bushes. It is plentiful in Great Britain. It has purple flowers and crimson berries, which latter may be mistaken by children for red currants, a mistake that has sometimes been attended with fatal consequences. *S. melongena*, Egg-Plant, Mad-Apple, Jew's-Apple, is a native of the East Indies, and also said to be of Arabia. This plant has purple flowers, and bears large smooth shining berries, which are the shape and size of a small hen's egg, and are used by the French and Italians in stews and soups. *S. Sodomeum*, Sodom Egg-Plant or Apple of Sodom, is a native of the North of Africa and the South of Europe. The fruit of this plant is white, and about the size of a walnut. It is very subject to the attacks of an insect which deposits its eggs within the germen, and as the fruit enlarges, the larvæ of the insect, as in the case of many other fruits, destroy and pulverise the whole of the interior, whilst the rind is left unchanged and entire. When the fruit is gathered under these circumstances, it is crushed to pieces by the hand; or if conveyed to the lips, the mouth becomes filled with an ash-like powder, exceedingly bitter to the taste. *S. sanctum*, Palestine Egg-plant, is a native of Palestine; it is often found in collections of plants. *S. Æthiopicum*, Æthiopian Nightshade, is a native of Ethiopia, China, and Japan. There are two varieties recorded: the one, the *Solanum Æthiopicum violaceum*, is a native of China, and the fruit is frequently eaten in that country as a dessert; the other variety, *S. Æ. aculeatum*, has a prickly stem, and small yellow berries of the size of peas. *S. Lycopersicum* of Linnæus, common Love-Apple, or Tomato. This, with some other of the older species of Solanum, now form the genus *Lycopersicum*. The present species is called *L. esculentum*. It is a native of South America, but it is much cultivated and well known in the United States of North America, and in France, Germany, and Italy. When ripe the fruit has an acid flavour, and is added to soups, sauces, &c. It is also used in confectionary as a preserve, and sometimes as a pickle. It is not often used in this country, but in Italy, near Rome, and Naples, whole fields are covered with it, and scarcely a dish is served up into which it does not enter as an ingredient.

SOLA'NUM DULCAMA'RA, an indigenous perennial climbing plant, common in wet and shady places, especially hedges. This plant is called Woody Nightshade, to distinguish it from the *Atropa Belladonna*, or Deadly Nightshade. The young twigs or tops are officinal, and they should be gathered in spring, before the flowering of the plant, or in autumn, while the leaves are yet fresh, as much activity seems to belong to the leaves; the twigs are best from plants about three years old. When fresh, the plant has an unpleasant odour, which is in a great measure lost by drying, as is also a large portion of water. The taste is at first bitter, and slightly acrid, then sweet; hence the name Bitter-Sweet given to it.

SOLAR MICROSCOPE. [MICROSCOPE, viii. 558.]

SOLAR SYSTEM. By the Solar System is meant that collection of bodies which contains the sun, the planets which revolve round him, their satellites, and such periodic comets as have had their returns successfully predicted. The system of the ancients includes the Earth as a fixed centre, with the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. That of the moderns includes at this day the Sun as a governing body (but not as a fixed centre), Mercury, Venus, the Earth (with the Moon), Mars, Vesta, Juno, Ceres, Pallas, Astræa, Hebe, Iris, Flora, Metis, Hygea [PLANETS, SMALL], a new small planet, Parthenope, announced as discovered by De Gasparis while this article was in the printer's hands, Jupiter and four satellites, Saturn (with the ring) and eight satellites, Uranus with six satellites, and Neptune with one satellite, besides the comets of Halley, Encke, and Biela. The following symbols are used to represent these bodies:—

☉ Sun	♄ Saturn
☿ Mercury	♅ Uranus (modern)
♀ Venus	♆ Neptune (modern)
⊖ Earth (modern)	⚵ Astræa (modern)
☽ Moon	⚳ Hebe (modern)
♂ Mars	⚷ Iris (modern)
⚶ Vesta (modern)	⚘ Flora (modern)
⚵ Juno (modern)	⚴ Metis (modern)
⚳ Ceres (modern)	Hygea (modern)
⚴ Pallas (modern)	Parthenope (modern)
♃ Jupiter	

Besides the discovery of the small planets, and the presumption which they afford that a larger planet may have been broken up, there are two additions of modern times, each of which is remarkable as a *discovery by prediction*. The first is the addition of comets to the system. For the account of the first introduction of a comet see HALLEY'S COMET. *Biela's Comet*, of 2460 days, was first seen in 1826, and predicted for 1832. *Encke's Comet*, of 1200 days, was seen in 1818,

and there shown by Encke to have been one which had been seen in 1795. The second circumstance is the prediction and discovery (in 1846) of a planet (Neptune) by assuming that the unexplained phenomena of the motion of Uranus were caused by the attraction of some planet still further from the sun, and calculating from the phenomena where the planet ought to be which would cause them. It is impossible for us to enter into the question which the simultaneous researches of MM. Adams and Leverrier gave rise to. For an excellent and detailed account of the whole of this remarkable page of the history of science, as well as for information on any subject of which it treats, we refer the reader to Mr. Robert Grant's 'History of Physical Astronomy,' in the continuation of the 'Library of Useful Knowledge.' The elements of the solar system are now given in dozens of works on popular astronomy with an extent which our limits forbid us from imitating.

SOLA'RIO, ANTONIO DE, called 'Il Zingaro,' or the Gipsy, was born in 1382, at Chivita, in the Abruzzi, according to Dominici ('Vite de' Pittori Napolitani'). He was a gipsy by birth, and in his youth was a sort of itinerant blacksmith. Nearly the same story is related of Solario as of Matsys. [MATSYS.] Solario fell in love with the daughter of Colantonio, who would not consent that his daughter should marry any one but a painter of reputation at least equal to his own. The suitor was allowed ten years for study; he departed from Naples a poor blacksmith, and returned, within the appointed period, a great painter. After his marriage he was much employed, especially at Naples, in painting altar-pieces, and in decorating the walls of convents and other religious houses with frescoes. In the fine expression of his heads, and in the richness and harmony of his colouring, he has been compared to Titian. Solario was also distinguished as an illuminator of manuscripts, especially Bibles. He died in 1455.

SOLDERING is the union of the surfaces of two metals, generally by the intervention of a third. In the ordinary mode of soldering, the alloy used as a solder must be more fusible than the metal or metals which are to be united, and must have a strong affinity for them. The solder usually contains a large proportion of the metal to which it is to be applied, in combination with some more easily fusible metals. To insure perfect metallic union between the solder and the surfaces to which it is applied, it is essential that they be made perfectly clean and free from oxide, and that the atmosphere be excluded during the operation, in order to prevent the formation of any oxide while the process is going on. This is effected in various ways, but most commonly by the use of borax, sal ammoniac, or rosin, either mixed with the solder or applied to the surfaces to be joined.

Various kinds of solders or alloys are used, according to the metal which is to be soldered. Platinum is soldered with gold. Gold is soldered with an alloy of fine gold, silver, and copper. Silver solders usually consist of silver mixed with brass, and sometimes with zinc. Brass, copper, and iron, are soldered with an alloy of zinc with copper or brass. Articles of wrought iron, and some qualities of steel also, may be soldered with cast-iron; the cast-iron being repeatedly heated and quenched in water, by which it becomes sufficiently friable to be beaten to a coarse powder with an iron pestle and mortar. Common *plumbers' solder* is made of two parts lead and one part block tin; or of the same metals mixed in nearly equal quantities; bismuth is added when it is desired to make the alloy more fusible. *Soft solder* has two parts tin to one lead; and other alloys of tin, lead, and bismuth, are used for uniting various articles of lead, tin, pewter, and other soft compounds. Such highly fusible solders are usually cast in ingots or strips, and melted as they are used by means of an instrument called a soldering-iron, which is tipped with copper—that metal being preferred for its greater affinity for tin. In soldering tin plates together, their edges are made to overlap; but in almost every other case the edges to be joined are made only to meet, the solder being run between their abutting edges.

A kind of soldering, called *burning-to*, has been long practised in some cases with sheet-lead, where it has been desirable to make a vessel entirely of that material; the junction being effected by pouring melted lead on to the edges to be united, until they fuse together. Somewhat similar to this is the process introduced some years ago under the name of *autogenous soldering*. This process, which is the invention of a French gentleman, M. de Richemont, consists in the union of two pieces of metal without the interposition of any solder, by fusing them at the point of junction by jets of flame from a gas blowpipe. The apparatus used for the purpose contains a hydrogen gas generator, bellows for atmospheric air, and valves for regulating the proportion in which the gas and air are to be mixed.

SOLDIER is a term applied to every man employed in the military service of a prince or state, but it was at first given to such persons only as were expressly engaged for pay, to follow some chief in his warlike expeditions.

In this country, even in the reign of George I., the pay both of officers and private soldiers was frequently postponed for years, and was sometimes entirely withheld. Such injustice no longer exists in the British army: the pay of the soldier is assured, and a well-appointed commissariat provides, as far as possible, for his wants while in the field.

Till lately the condition of a private soldier, both in this country and on the Continent, was unfavourable for inspiring a love of the service. But the condition of the soldier is now much improved. His pay suffices to afford him the means of obtaining the comforts of life in a degree at least equal to those which are enjoyed by an ordinary peasant or mechanic. With the improvement of his condition, a corresponding improvement in the character of the soldiers has taken place: men of steady habits are induced to enlist, and officers are enabled to select the best among those persons who present themselves as recruits.

The duties of the soldier are now rendered as little burthensome as is consistent with the good of the service; and the army regulations prescribe that he shall at all times be treated with mildness and humanity: even the non-commissioned officers are required to use patience and forbearance in instructing the recruits in their military exercises. When breaches of discipline on the part of the soldier oblige a commander to order the infliction of punishment, attention is paid as much as possible to render it a means of promoting a reformation of character: the lash is now very sparingly used. Wherever a regiment is quartered, there is established for the soldiers a school, which the men are obliged, as part of their duty, to attend, and which is generally furnished with a library for their use. The library and school are formed and supported by the subscriptions of the officers, and both have been found to contribute greatly to the preservation of sobriety and good conduct among the men.

In time of peace, the soldier, being surrounded by the members of civil society, must, like them, conform to the law; and, being under the influence of public opinion, he is, unconsciously to himself, held in obedience by it; so that no extraordinary coercion is necessary to keep him within the bounds of civil or military law. But in the colonies the soldier, even though he be serving in a time of peace, has many temptations to fall into a neglect or breach of discipline, and there is a necessity for greater restraints on the freedom of the soldier, and for the infliction of heavier punishments than are required at home. In time of war and on foreign service a vigorous discipline is necessary: the privations to which soldiers are then exposed strongly induce those who are not thoroughly imbued with moral and religious principles to plunder the country people, in order to supply their immediate wants, or to drown the sense of their sufferings in liquor. The efforts made by the British commanders, during the war against the French in Spain, to maintain order, and prevent the people of the country from being injured, were great and praiseworthy. Perhaps fewer crimes were committed by the British troops than by those of their allies or their enemies; but still there were many occasions in which the national character was disgraced by the misconduct of the soldiery.

SOLE. [PLEURONECTIDÆ.]

SOLECISM (*soloecismus*, *σολοικισμὸς*), a grammatical term which is used by the later Greek and Roman writers, and by modern grammarians also. It is defined by Sinnius Capito (Gell., v. 20) as an unequal and improper arrangement of the parts of speech, that is, as a violation of the rules of syntax. Quinctilian (i., s. 28, &c.) specifies four kinds of solecisms: the first consists in the addition of a superfluous word; the second, in leaving out one that is necessary; the third, in perverting the order of words of a sentence; and the fourth, in using an improper form of a word. The ancients also used the word in a wider sense, to signify any kind of fault, error, or mistake in speaking, writing, or acting. Modern grammarians designate by solecism any word or expression which does not agree with the established usage of writing or speaking.

The term solecism is said by the ancient grammarians to be derived from Soli, a town of Cilicia, where the language of the Greek settlers became corrupted.

SOLE'NODON, a genus of insectivorous mammals established by Brandt on a specimen sent from the island of Hispaniola by Jaeger.

Generic Character.—Habit generally between that of *Sorex* and *Didelphys*. Muzzle elongated, the snout smooth, produced, and with nostrils at the sides of its apex. Eyes minute. Ears large, rounded, nearly naked. Body hairy. Stern and upper part of the rump beset with a few very short silky hairs. Feet ambulatory, plantigrade, pentadactylous; claws falcular, those of the fore feet the longest. Teats inguinal. Tail long, smooth, and for the most part scaly.

Incisors, $\frac{6}{6}$; molars (spurious $\frac{6}{6}$, true $\frac{8}{8}$) = 40.

Example.—*Solenodon paradoxus.*

Description.—Sides of the head and neck dilute yellow-brown, mixed with ferruginous, and, occasionally, with gray. Abdomen and feet dilute yellow-brown, with hardly a mixture of gray. Space upon the breast between the anterior limbs dilute ferruginous, extended to the internal side of the feet, and, anteriorly, to the cubit. A similarly-coloured space occupies the inguinal region, and also extends upon the anterior part of the legs. Upper part (dorsum) of the muzzle, forehead, vertex, middle of the nape, and anterior part of the back, tinged with black-brown: the rest of the back black-brown, the colour (more diluted) extending towards the posterior part of the sides and towards the extremities.

Habits, &c.—Brandt remarks that nothing is known of the mode of life of this animal; but, from the structure of the proboscis and claws, he concludes that it must burrow. Its true place is probably among the SORICIDÆ.

SOLICITOR. [ATTORNEY.]

SOLID, SOLIDITY. (Mechanics.) A solid body is one which is composed of matter so connected together that the relative positions of its parts cannot be altered without the application of sensible force. Solidity denotes frequently that state of a body; but for the strict sense of the word see IMPENETRABILITY.

SOLID ANGLE, a name given to the idea of opening conveyed by three planes which meet at a point.

SOLID, SURFACE, LINE, POINT. (Geometry.) According to Euclid, a point has no dimensions; a line, length only; a surface, length and breadth; a solid, length, breadth, and thickness.

Space being distinctly conceived, parts of space become perfectly intelligible. Hence arises the notion of a boundary separating one part of space from the rest. That a material object, a desk or an inkstand, occupies a certain portion of space, separated by a boundary from all that is external, needs no explanation: this boundary is called surface, and possesses none of the solidity either of

the desk or inkstand, or of the external space. Surface *itself*, when distinctly understood, is capable of division into parts, and the boundary which separates two parts of a surface has none of the surface, either on one side or the other: it therefore presents length only to the imagination. Again, length itself is capable of division into parts: the boundaries do not possess any portion of length, either on one side or the other: they are only partition marks or points. Euclid reverses the order of our explanation, requiring first the conception of a point, then of a line, then of a surface, then of a solid.

It matters nothing that the point, line, and surface are mechanical impossibilities, that no point or line, if they actually existed, could reflect light to show them, and that no surface could continue to exist for any perceptible time, even supposing it to have one moment of existence. Neither does it signify whether the ideas are necessary, or acquired from the senses; the question in geometry is, Have you got them? not, How did they come? There may be danger that some students should need at first to be frequently reminded of the abstract limits of which the conceptions must be made permanent, lest they should accustom themselves to rest in the imperfect approaches to these conceptions which are realised in their diagrams; but it is always found that a moment's recollection will produce a satisfactory answer to any question upon this point.

There is, it is true, one circumstance in which the pupil may acquire a permanently false notion of the object of geometry. If an instructor should require what is called a very well-drawn figure in every case, with very thin *lines* and very small *points*, he may perhaps succeed in giving the learner some idea that geometry consists in that approach to accuracy which constitutes practical excellence in the applications of the science. No idea can be more false: let the good line be examined under a microscope, and it is seen to be a solid mound of black lead or ink, as the case may be. Hence it is perhaps desirable that the demonstrations should be frequently conducted with what are called ill-drawn figures, in order that no reliance may be placed on the diagram, further than as serving to remind the student of the ideal conception which is the real object of his demonstration. This of course is recommended without prejudice to his learning the accurate use of the ruler and compasses for another distinct purpose, namely, the intention of producing avowedly approximate results.

It is to be noted that these definitions, so called, are in Euclid more than definitions. They appeal to conceptions supposed to exist, in words which are considered sufficient not to give, but to recall, the necessary ideas.

SOLID, SUPERFICIAL, AND LINEAR DIMENSIONS. A solid, a surface, and a line, when they come to be the objects of arithmetic, are things as distinct as a weight and a time. Length only can measure length, a surface only a surface, a solid only a solid. Reasons of arithmetical convenience, not of necessity, make it advisable that whatever length may be chosen to measure length, the square on that length should be the surface by which surface is measured, and the cube on that length the solid by which solidity is measured. Unfortunately, if a foot be the measure of length, the square on a foot and the cube on a foot have no other names than *square foot* and *cubic foot*. The farmer with his acres, and the distiller with his gallons, have an advantage which is denied to the young mathematician. Ask the first how many acres make a gallon, and the second how many gallons make an acre, and both would laugh at the question; the third is allowed an indistinct conception of measuring surfaces and solids in feet or inches, as if they were lines, from the occurrence of the same word in all his measures.

Length is said to be a quantity of one dimension, surface of two, and solidity of three. The right line, the right surface or rectangle, and the right solid or rectangular parallelopiped (the figure of a box, a die, a plank, a beam, &c.), are the implements of mensuration. Every surface must be reduced to the second form, and every solid to the third, before it can be measured. The two fundamental theorems by which measurement becomes practicable are as follows:—

1. The numbers of linear units in the two sides of a rectangle, being multiplied together, give the number of superficial units, square units, or squares on the linear unit, which the rectangle contains. Thus a rectangle of $2\frac{1}{2}$ by $4\frac{1}{3}$ feet contains $\frac{5}{2} \times \frac{13}{3}$, or $\frac{65}{6}$, or $10\frac{5}{6}$ *square* feet.

2. The numbers of linear units in the length, breadth, and thickness of a right solid, being multiplied together, give the number of solid units, cubic units, or cubes on the linear unit, which the right solid contains. Thus a plank of $2\frac{1}{4}$ inches broad, $1\frac{1}{2}$ inch thick, and $10\frac{1}{4}$ inches long, contains $\frac{9}{4} \times \frac{3}{2} \times \frac{31}{3}$, or $\frac{279}{8}$, or $34\frac{7}{8}$ *cubic* inches.

SOLIDS. [Regular Figures.]

SOLIDA'GO, a genus of plants belonging to the natural order *Compositæ*, the suborder *Corymbiferæ*, and the tribe *Asteroideæ*. *S. virgaurea*, Golden Rod, is a native of the woods and thickets of Great Britain, and was formerly much used in medicine. Its leaves and flowers are said to be aperient, and it has been employed for internal hæmorrhages. It is astringent and tonic.

SOLIMAN (surnamed by the Turks *Kanooni*, or 'the Legislator,' and by European writers 'the Magnificent'), the tenth and greatest of the Ottoman sultans, succeeded his father Selim I., A.D. 1520 (A.H. 926), in the twenty-seventh year of his age. His first exploit was an invasion of Hungary (1521), in which he captured Belgrade. In the following year he took Rhodes. In 1526 Hungary was again invaded; the king, Lewis II., and nearly all his army, were slain in the fatal battle of Mohacz, and the whole kingdom was overrun by the Turks. The Hungarian crown was conferred by Soliman on John Zapolya; but the rival pretensions of Ferdinand of Austria kindled the first of the long wars between the sultans

and the German emperors; and in 1529 Vienna was besieged without success by Soliman in person. A war with Persia followed, in which Armenia and Irak, with the cities of Tabreez and Bagdad (1534), were subdued by the Ottomans; while Yemen and the Arabian coast were subjugated by the pasha of Egypt, and armaments sent even to Gujerat to aid the Indian Moslems against the Portuguese. The fleets of the vassal states of Barbary, under the famous corsair Khair Eddin, or Barbarossa, at the same time swept the Mediterranean, and laid waste the Italian coasts; and Croatia was conquered (1537) after a great victory over the Imperialists at Essek. The death of John Zapolya (1541) wrought a fresh change in the affairs of Hungary, great part of which was seized by the Turks. Buda became the seat of a pasha; and the war continued, generally to the advantage of the Sultan, till a truce was concluded in 1547, by which Austria agreed to pay a tribute of 30,000 ducats for her remaining possessions in Hungary. In the same year a fresh invasion of Persia led to the capture of Ispahan; but this conquest was not long retained. The war with the house of Austria for Hungary again broke out in 1552; and Transylvania was subdued and made a principality under the Porte. Persia was again attacked, and Erivan taken in 1554; but a peace was concluded with the Shah in the following year. But the martial glories of Soliman were clouded by domestic dissensions. His eldest son, Mustapha, had been put to death in 1553, at the instigation of his stepmother Roxalana; and the jealousies of the two surviving princes, Selim and Bayezid, having ended in the rebellion of the latter, he was defeated and put to death with his children (1561).

The united fleets of the Porte and of Barbary had ruled the Mediterranean since the battle of Djerbeh in 1560, but they were repulsed with great loss in the siege of Malta (1565) by the heroism of the grand-master John de la Valette. The war in Hungary meantime continued; and in 1566 Soliman headed his armies for the last time for its invasion; but he died in his tent before the walls of Szigeth, Sept. 5, 1566, the day before the capture of the town. His only surviving son, Selim II., succeeded him.

Soliman was not less distinguished as a patron of literature and the arts than as a warrior and a legislator. He was a poet of no mean rank; and the encouragement which he afforded to the employment of the Turkish language, forms an æra in the literature of the country.

SOLIME'NA, FRANCESCO, Cavaliere, called l'Abate Ciccio, was born at Nocera de' Pagani in 1657. He was intended for the law, but having a taste for art, he was first taught by his father Angelo, who was the pupil of the Cav. Massimo, and studied afterwards at Naples under Francesco di Maria, and in the academy of Pietro del Po. Solimena was one of the best and most correct painters of his time; he had great versatility of talent and much facility of execution. He died at Naples, extremely wealthy, in 1747. His works are numerous: the principal of them are the frescoes of the sacristy of the Theatines of San Paolo Maggiore; others, in oil, in the Church of the Apostles, and those of the Chapel of San Filippo Neri in the church dell' Oratorio. His portraits include some of the principal kings and princes of his time. Solimena was also a poet; his sonnets have been several times published.

SOLINGEN. [DÜSSELDORF.]

SOLI'NUS, CAIUS JU'LIUS, a Roman writer of whose life and period nothing is known. His work, entitled 'Polyhistor,' is merely a compilation from Pliny's 'Natural History.' Indeed Salmasius says ('Prolegomena') that the work contains nothing which is not found in Pliny; that Solinus got together all that he could out of Pliny's work, and put it in his compendium, keeping the same arrangement and nearly the same words. Solinus however never mentions Pliny, though he cites near one hundred authors. The principal edition is that of Salmasius, 2 vols. fol., Paris, 1629; and 2 vols. fol., Utrecht, 1689; a work, says Morhofius ('Polyhistor,' ii. c. 2), accompanied with a most enormous commentary, in which the editor has collected all that he could find in the ancient writers on the topics which Solinus discusses, and has given also his own opinions; but the editor, as usual, did his work in a hurry, and made various blunders, which a little more attention might have prevented.

There is an English translation of Solinus, by Arthur Golding, Lond., 1587 and 1590.

SOLI'S, JUAN DIAZ DE, was born at Lebrixa, in the province of Seville. In 1506 he sailed, in company with Vicente Yañez Pinzon, on an expedition to find the strait or passage supposed by Columbus to lead from the Atlantic to a southern ocean. This of course proved unsuccessful, but they explored the northern coast of South America, and are supposed to have discovered Yucatan. On their return to Spain, Solis and Pinzon were appointed royal pilots, and again entrusted with the command of an expedition for the discovery of new lands. This expedition proving unsuccessful, they were both deprived of their offices and emoluments, and Solis was put in prison. In 1512 Solis obtained permission to sail on a voyage of discovery; but was obliged to raise among his friends the funds required for the expedition. Pursuing a southward course, he discovered Cape Frio, and entered the Bay of Rio Janeiro. Solis took possession of the northern coast in the name of the king of Castile. Proceeding farther along the coast, he saw several Indians, who told him of a river called Paraguaya, *i.e.* great water, on the banks of which gold was said to be found in large quantities. Solis then returned to Spain, and obtained the requisite leave to undertake the conquest of the lands watered by that river, for which he sailed, Oct. 8, 1515, with three caravels, having seventy soldiers on board. On his arrival at Rio Janeiro, Solis left two of his ships behind, and sailed with the third in search of the Indians with whom he had conversed on his first voyage. He found them; but on landing with a great part of his crew, they were surrounded and put to death by the Indians. This catastrophe happened near a small river between Maldonado and Montevideo, now called 'El Rio de Solis.'

SOLI'S, ANTONIO DE, was born at Placenzia, July 18, 1610. His parents sent him to Salamanca to study the law; but he preferred literature. At the age of seventeen he wrote a successful comedy called 'Amor y Obligacion' (Love and Duty). His various talents procured him a patron in the count of Oropesa, then viceroy of Navarre, who appointed him his secretary, whom he highly praises in several of his poems. On the birth of one of his patron's sons he composed an heroic drama called 'Orpheo y Eurydice.' In 1642 Solis was appointed to a lucrative office in the secretary of state's department, and subsequently made secretary to Philip IV. It was in order to celebrate the birth of a son of this king, that Solis composed one of his best comedies, 'Triumfos de Amor y Fortuna' (Triumphs of Love and Fortune). After the death of Philip, Solis was appointed to the office of Cronista de las Indias, or first historiographer of the transactions of the Spaniards in both Indies. In this capacity he wrote his 'Historia de la Conquista de Mexico,' Madrid, 1682, a work which has ranked him among the best prose writers of Spain.

Solis is better known out of Spain as an historian than as a dramatic writer, yet he occupies a prominent place among the poets of that nation. At the age of fifty-six he entered into holy orders, and devoted himself almost exclusively to exercises of devotion. He wrote nothing afterwards but some dramatic pieces upon sacred subjects. He died April 19, 1686. Juan de Goyeneche wrote an account of his life and writings, which appeared first at Brussels in 1704, with the 'History of the Conquest of Mexico,' and has been prefixed to almost every subsequent edition of the same work.

SOLITAIRE. Even so late as the middle of the 17th century, certain wingless birds, of strange aspect, inhabited the islands of Mauritius, Rodriguez, and Bourbon. These now extinct birds were formerly, and even at a later period, regarded by naturalists as referable to one species, viz. the DODO; but there is now reason to believe that three or four species, perhaps even more, distinct from each other, inhabited these islands respectively; of these, one was the Solitaire (*Pezophaps solitaria*, Strickland; *Dido solitarius*, Gmelin), which appears to have been confined to the island of Rodriguez. This island, which is about 15 miles long by 6 broad, is situated about 300 miles to the east of Mauritius. It appears to have remained in a desert and uninhabited condition until 1691, when a party of French Protestant refugees settled upon the island and remained there for two years. Their commander, François Leguat, a man of intelligence and education, has left a highly-interesting account of their adventures, and of the various productions of the island, among which the Solitaire takes a conspicuous place. ('Voyage et Aventures de François Leguat,' 2 vols. 12mo, Lond., 1720, 2nd ed.)

Mr. Strickland observes that the name *Solitaire* had originally been given to an allied, though doubtless distinct bird in Bourbon; and that Leguat, who never visited Bourbon, supposed the Rodriguez bird to be the same species, and therefore gave it the name which other voyagers had imposed upon the Bourbon bird; he adds, 'As Leguat's bird is the type of the *Didus solitarius* of systematists, I prefer retaining for it *par excellence* the name of Solitaire.' It would appear however that besides the *Solitaire* (not Leguat's) of Bourbon another brevipennate bird, called *Oiseau Bleu*, inhabited that island, as will be seen by referring to 'Proc. Zool. Soc.,' Pt. xii. p. 77, and to the 'Nat. Hist. of the Dodo,' &c., by Messrs. Strickland and Melville, p. 59.

Very few osteological relics of these birds, whether in the cabinets of England or of the Continent, present themselves for investigation. No fragment however has escaped Dr. Melville's scrutiny; and after as rigorous a comparison as possible under the circumstances, he has arrived at the conclusion that the Dodo, the Solitaire, and their tribe, constituted an aberrant group of the Columbine order or family. This opinion is strongly advocated by Mr. Strickland; and we may add that many of the most able ornithologists of the day concur in it, startling as the theory at first appeared.

SOLITA'RIUS (the Dodo, frequently translated the Hermit, by those who do not remember the Latin name of the extinct bird), an obscure constellation of Lemonnier, which, having been admitted into the Astronomical Society's lists, appears here. It is situated a little above Centaurus, near the tail of Hydra.

SO'LLYA, a genus of plants of the natural family of *Pittosporeæ*, closely allied to *Pronaya* and *Billardiera*. The species are highly-ornamental plants, which are indigenous in Australia and Van Diemen's Land.

SOLMISATION, or *Sol-fa-ing*, in singing, is the art of applying to the seven notes of the scale certain syllables, which have no meaning in themselves, but are easy to remember and to sound. This art was practised by the Greeks; but the six syllables now in use are generally attibuted to Guido d'Arezzo. These he selected, on account of their furnishing all the vowel sounds, from the following stanza of a monkish hymn to St. John the Baptist:—

'*Ut* queant laxis
Resonare fibris,
Mira gestorum
Famuli tuorum
Solve polluti
Labii reatum,
SANCTE JOANNES.'

For the seventh note of the natural scale, Le Maire introduced the syllable *si*. The Italians rejected the French *ut*, and substituted the more euphonous syllable *do*, which is also adopted in England. The syllables therefore now used by the Italians and English are as follows:—

Do,	Re,	Mi,	Fa,	Sol,	La,	Si,	Do.
C,	D,	E,	F,	G,	A,	B,	C.

To these syllables the English give the Italian pronunciation.

SOLOMON, the son of David and Bathsheba, was born B.C. 1033, and was named by God, through the prophet Nathan, 'Jedidiah,' that is, 'beloved of the Lord.' (2 Sam., xii. 24, 25.) In the old age of David, his son Adonijah attempted

to seize the kingdom, upon which David had Solomon proclaimed and anointed king, B.C. 1015. (1 Kings, i.; 1 Chron., xxiii.) In the same year David died, after giving certain charges to Solomon. (1 Kings, ii.) The first acts of Solomon were to punish the enemies of David, and especially Adonijah and his adherents. He then contracted a close alliance with Pharaoh, king of Egypt, whose daughter he married. For an account of the principal events of Solomon's reign; the gifts of wisdom, riches, and long life which he received from God; the erection of the Temple to God at Jerusalem, &c., we must refer the reader to the books of Kings and Chronicles. His prosperity at length corrupted him; and among his establishments was a large harem, filled with women from idolatrous nations. These women seduced him into idolatry, as a punishment for which God threatened to divide his kingdom after his death; and even during his life signs were given of the coming calamity in the rebellion of Hadad the Edomite, Rezon, king of Syria, and Jeroboam, the son of Nebat, who afterwards became king of the ten revolted tribes of Israel. (1 Kings, xi.; Nehem. xiii. 26.)

It is generally supposed that this threat had the effect of recovering Solomon from his idolatry, and that he then recorded in the book of 'Ecclesiastes' his confessions of the vanity of worldly wisdom, riches, and honour. Among the other works ascribed to him are the 'Book of Proverbs,' of which he must be regarded as the compiler rather than the author, the 'Song of Solomon,' the 'Wisdom of Solomon,' and the Psalms lxxii. and cxxvii. There is also a collection of 18 psalms, entitled 'The Psalter of Solomon,' which was found in the library at Augsburg, by Schott, written in Greek, and translated into Latin by de la Cerda, which are generally supposed to be the composition of some Hellenistic Jew, in imitation of the Psalms of David. Other writings ascribed to Solomon are mentioned by Suidas and by Eusebius. Solomon died in the year 975 B.C., after a reign of forty years. (1 Kings, xi. 42, 43; 2 Chron., ix. 30, 31.)

The reign of Solomon was the period of the highest prosperity of Israel and the commencement of its decline, both in its religious and civil state. Solomon has always had an extensive fabulous reputation in the East. As early as the time of Josephus magical powers were ascribed to him ('Antiq.,' viii. 2, 5; comp. Origen, 'Ad Matth.,' xxvi. 63; Nicet. Chon., 'Annal.,' iv. 7). The similar traditions of the Arabians concerning him have been collected by Mr. Lane ('Thousand and One Nights').

SOLOMON, THE SONG OF, or THE BOOK OF CANTICLES, 'Canticum Canticorum,' which titles mean 'The Song of Songs,' that is, 'the most beautiful song,' a canonical book of the Old Testament.

The canonical authority of this book has been much disputed. It is now admitted on all hands that it formed part of the Jewish canon. It is found in the oldest Christian catalogues of the sacred books, and in all the ancient versions. The argument that it is not quoted in the New Testament is of little weight against this mass of external evidence. The same objection would apply to other parts of the Old Testament. The objections to its canonical authority are now therefore derived solely from its internal character, and may be summed up in the following argument: that the book cannot form a part of the Holy Scripture, since it contains no religious truth, unless we interpret it after a fashion for which there is no authority.

The style and language are not more different from that of the 'Book of Proverbs' than might be expected from the difference of the subjects. But the structure and contents of the poem are alleged as presenting insuperable obstacles to the supposition that Solomon was the author. Nearly all expositors, both Jewish and Christian, have adopted the allegorical interpretation, though they have explained the allegory in different ways. Those who acknowledge its canonicity, but reject the idea of a reference either literally to Solomon or figuratively to Christ, believe its admission into the canon to be a divine recommendation and praise of a single virtuous marriage as opposed to polygamy and concubinage. This appears to be the opinion of Dr. J. Pye Smith in his 'Scripture Testimony to the Messiah,' though he denies the canonicity. Various opinions are held as to the structure of the Song, the best of which appears to be that which takes it to be a series of Idyls.

SOLOMON, THE WISDOM OF, an apocryphal book of the Old Testament, ascribed to Solomon, but manifestly written long after his time. It is not known to have ever existed in Hebrew, and it contains Greek ideas and expressions which prove it to belong, if to a Jew at all, to one of the Alexandrine school. Internal evidence would point to the end of the first or beginning of the second century B.C. as the time of its composition. It is commonly ascribed to Philo the Jew, but the style is quite different from his genuine writings. The fathers of the church considered it apocryphal; but it was pronounced canonical by the third council of Carthage (A.D. 397) and again by the council of Trent. It is remarkable as being the earliest Jewish work extant which contains a clear statement of the doctrine of rewards and punishments in a future state.

SOLOMON'S ISLANDS. [NEW GEORGIA, ARCHIPELAGO.]

SOLON, son of Execéstides, a descendant of the royal house of Codrus, was born about B.C. 638, in the island of Sálamis. In his youth he visited several countries, and he probably returned to Athens soon after the Cylonian conspiracy (612 B.C.), at which time Athens was distracted by internal feuds. It had shortly before been deprived of the island of Sálamis by the Megarians, and in the ensuing war Athens had suffered such losses that a decree was made that any one who ventured to propose the continuance or renewal of war should be punished with death.

Solon being endowed with considerable poetical talents, composed an elegy upon the loss of Sálamis, and assuming the appearance of a madman, rushed into the Ágora to recite his poem. The result was that the Athenians repealed the law

respecting Sálamis, and resolved to try to recover that island. Solon was placed at the head of the Athenian forces, and led them to victory. All the Megarians in Sálamis were either slain or dismissed to their homes, and Sálamis again came into the hands of the Athenians. In the war between Delphi and Cirrha (about 600 B.C.), Solon advised the Athenians to support Delphi against the sacrilegious Cirrhæans. His advice was followed, and Cirrha was destroyed.

In consequence of the massacre of the friends of Cylon, who had taken refuge in the temples and at the altars of the gods, the republic was divided between two factions. A part of the Athenians were enraged against Mégacles and his associates for their violation of all religious feelings in the matter of Cylon, and the surviving friends of Cylon did their utmost to foster this hostility against their enemies. Solon, who appears to have belonged to neither party, persuaded the Megaclids to submit their case to a commission of nobles, whose decision was that they must leave the country.

Notwithstanding the removal of the Megaclids from Athens, the party feuds continued to rage, and the only remedy was a reform of the constitution. This however could not be effected unless all religious fears were allayed by a complete purification of the city. This was done by Epiménides of Crete, whom the Athenians invited for this purpose. The way was thus prepared for the legislation of Solon.

The three ancient local divisions of the country, the lowlanders, highlanders, and the inhabitants of the coast, formed three political parties. The highlanders were the most democratical, the lowlanders the most oligarchical, and the men of the coast wished to reconcile the two other parties. Besides these political parties, a struggle was going on between the wealthy and the poor. Many of the poor had not only lost their property, but, not being able to pay their creditors, had become the bondsmen of their wealthy oppressors, and some had even been sold as slaves into foreign countries. Solon appeared to be the only man who was impartial and skilful enough to mediate between the hostile parties. In the year B.C. 594 he was invested with the office of archon, and empowered to frame a new code of laws.

The first measure of Solon was to relieve by a kind of general insolvent act those who were hard pressed by debt. He established a reduction of the rate of interest (which was probably made retrospective), and also lowered the standard of the silver coinage in such a manner, that 73 old drachmæ became worth 100 new ones. (Plut., 'Solon,' 15.) In this manner if a debtor of 100 old drachmæ paid only 73, his creditor lost 27 per cent. He also released the pledged lands, but it is not clear whether this was effected by a particular measure, or whether it was included in his insolvent act. Those citizens who had been enslaved by their creditors were restored to freedom. Finally, the law which gave to the creditor a right to the person of his insolvent debtor was abolished. Some of the ancient writers state that he cancelled all debts, but the best authorities do not mention any such measure, and it is very improbable that such a fraud could be perpetrated in any state. Solon now proceeded to the second and more difficult part of his task. The first thing he did was to abolish the bloody laws of Draco, with the exception of those relating to murder. The characteristic feature of his new constitution was, that he substituted property for birth as a title to the honours and offices of the state. The change brought about by this new standard could not at first be great, as the eupatrids or nobles were the wealthiest citizens. According to their property, he divided the whole population of Attica into four classes, and regulated their political rights and duties according to the amount of their income from their landed property. The fourth class, whose income was below a certain amount, were excluded from all offices in the state, but they had the right of voting in the popular assembly, and the exercise of the judicial power. They also formed the light infantry in the armies. The archonship and the other great civil and military offices, which had before been held by the nobles alone, became now accessible to all the citizens contained in the first class, while the second and third classes had access to all the minor offices. The public burdens were distributed according to the classes; the contributions to the necessities of the state were for the lower classes proportionately light, for the second and third classes were not taxed according to the real value of their property, but that of the second class was reduced by one-sixth, and that of the third class by one-third below its real value. The fourth class was altogether exempted from direct taxes.

The four old tribes into which Attica was divided were left unaltered by the new constitution. From the judicial sentence of a magistrate an appeal was left to the popular courts of justice, which were numerously composed of citizens of all classes indiscriminately. Two other institutions, which were intended as bulwarks against democratical extravagance, the senate of four hundred and the council of the Areopagus, are almost unanimously ascribed to Solon. But as regards the senate, there can be no doubt that it existed previous to the legislation of Solon, who raised it to the number of four hundred, and threw it open to all citizens belonging to the first three classes, in such a manner that each of the four tribes was represented in it by one hundred members. All members of the senate were changed every year. The senate was divided into sections, called prytanies, which succeeded each other in the management of the affairs throughout the year, and held their assemblies in the Prytaneum. Concerning the council of the Areopagus, see AREOPAGUS. No measures could originate in the popular assembly, and its discussions were confined to such measures as had been prepared by the senate. Though the political power of the assembly was limited, the judicial power with which Solon invested it was considerable. Out of the popular assembly 6000 men above the age of thirty were chosen every year by lot, to form a supreme court of justice called the Heliæa (ἡλιαία), to which

appeals were made from the sentence of magistrates, and which had in certain cases to take cognizance, independently of any other court, and in subsequent times assumed all judicial power in the state.

When his legislation was completed, Solon is said to have asked permission to leave Athens for ten years, hoping that during this period the people would become familiar with their new institutions. He is said to have visited Egypt, Cyprus, and Asia Minor. The beautiful story of his interview with Crœsus, king of Lydia, which is told by Herodotus, Plutarch, and others, is inconsistent with chronology, as even some of the ancients have observed, for Crœsus did not come to the throne till about 560 B.C., some twenty or thirty years later than the time at which Solon must have visited Asia Minor. On his return he found Athens again distracted by factions; the result of which was that Pisistratus made himself tyrant, to use the language of the times. Solon probably died about B.C. 559. Solon was a poet as well as a legislator. The few remains of his poetry are distinguished by simplicity and vigour. They have been collected several times separately, and they are printed in Bergk's 'Lyrici Poetæ Græci,' 1843.

SOLOTHURN, or *Soleure*, a canton of Switzerland, bounded N. by Basel, E. by Aargau, S. by Bern, and W. by Bern and France, has an area of 254 square miles, and 63,196 inhabitants, all Catholics. The surface is crossed from S.W. to N.E. by the Jura, which forms several parallel ridges, and covers the greater part of the canton. The principal valley is that of the Aar, which runs in the same direction eastward of the Jura. The highest summits of the Jura in the canton of Soleure are the Weissenstein and the Hasenmatt, which latter is about 4400 feet above the sea. The canton is one of the most productive in Switzerland, especially in corn, fruit, and vegetables. The vine thrives only in certain localities. The mulberry-tree is cultivated, and some silk is made. The number of horned cattle, sheep, goats, pigs, and horses is very great in proportion to the area of the canton. The horse-fair of Soleure is one of the principal in Switzerland. A considerable quantity of cheese is made, both of cow and goat milk. Part of the mountains are covered with timber trees, especially fir and beech. The canton abounds in iron-mines, and the ore is smelted in the furnaces of St.-Joseph, and worked at the iron-works of Klus. The other manufactures consist of leather, paper, woollens, and kirschwasser. There are also quarries of marble and gypsum.

The canton is divided into 134 communes, each of which has an elementary school and a fund for the relief of the poor.

Solothurn, or *Soleure*, a bishop's see, and the head town of the canton, is built on the Aar, 1320 feet above the sea, and is surrounded by walls. The population according to the census of 1850 was 5370. The cathedral is reckoned the finest church in Switzerland; the tower is 190 feet high. The other remarkable buildings are the town-house, which is very old; the arsenal, the theatre, the hospital, the fountain in the market-place, the former church of the Jesuits, and several convents. Soleure has a gymnasium, a lyceum, a faculty of theology, a library of 15,000 volumes, a botanical garden, and a cabinet of natural history. The town is 10 miles N. from Bern, and 26 S. from Basel.

SOLRE-LE-CHÂTEAU. [NORD.]

SOLSTICES, the points of the ecliptic which are highest above the equator, at which, the sun's motion in declination being imperceptible, the days remain sensibly unaltered in length for several days together, as they would do if the sun absolutely stood still: whence the name.

SOLUTION. (Mathematics.) By the solution of a problem should be meant the method of finding that which the problem requires to be found; but the word is frequently understood to apply to the answer itself.

SOLVENT is that which has the power of rendering other bodies liquid; and chemically, a menstruum. Of all the solvents, water is the most universal and useful; it dissolves a great number of neutral vegetable products, as gum, sugar; and of saline bodies, as common salt, sulphate of soda, &c. The solvent of resinous bodies is alcohol, and of some similarly constituted substances; while caoutchouc is insoluble in it, but is dissolved by naphtha, oil of turpentine, and æther. The metals are insoluble in any solvent until they have suffered some change by its action, or by a similar change otherwise produced.

Heat has great power in altering the solvent power of bodies; in most cases it increases it, and hence, when it is required to crystallise certain salts, they are dissolved in hot water, and the solvent power of the water diminishing as the solution cools, the salt is deposited in crystals. In some cases however heat diminishes the solvent power. When any solvent has taken up as much of any particular substance as it is capable of taking up, the solution obtained is termed a Saturated Solution. That the change of form from solid to fluid is the result of chemical affinity, is shown by the fact that water which is saturated with one substance will take up another; thus a saturated solution of common salt will still dissolve sulphate of soda, and vice versâ.

SOLWAY FRITH, an æstuary or inlet of the sea, on the western side of the island of Great Britain, separating, in one part, England from Scotland. This æstuary extends inland, from a line drawn between Rayberry-Head, in Kirkcudbrightshire to St. Bees' Head, in Cumberland, 41 miles N.E. to Solway Moss at the mouth of the Esk. The line between the two above-mentioned headlands, which may be regarded as measuring the mouth or entrance of the Frith, is more than 20 miles long. About 17 miles up, between Southerness Point, Kirkcudbrightshire, and Beckfoot, in Cumberland, the width is diminished to 7 miles: it afterwards expands, then again contracts; and 15 miles farther up, between the mouth of the Annan, Dumfriesshire, and Bowness, in Cumberland, it is reduced to 2 miles: this continues to be the width of the æstuary for the

remaining 9 miles to its termination. [CUMBERLAND.]

A considerable part of the frith between Southerness Point and Allonby is occupied by broad sands, dry at low water, and intersected by the channels formed by the streams which flow into the frith. The frith is navigable through the greater part of its extent for vessels of 300 tons, and for those of 100 tons up to the head. The tide sets into it with great force, the flood sometimes advancing with a head three or four feet high.

At the head of Solway Frith is Solway Moss, a tract of bog, in Cumberland. In 1771 this bog burst, and overflowed several hundred acres of fertile land, sweeping away the tenants' houses with its black stream. By great exertion and expense the land was again brought into cultivation, and all trace of the catastrophe obliterated.

Solway Moss is memorable for the defeat of the Scots, A.D. 1542. A body of 10,000 men under Lord Maxwell and the Earls of Cassilis and Glencairn, entered England; but the leaders were corrupt, and the men mutinous; and on being attacked by a force of 1400 English, the whole army took to flight, leaving nearly 1000 prisoners, of whom 200 were lords, esquires, or gentlemen. Lord Maxwell, the commander-in-chief, was among them. James V. of Scotland is said to have died of vexation, in consequence of this defeat, about a month after it took place.

SOLWAY MOSS. [SOLWAY FRITH.]

SOMERS, JOHN, LORD SOMERS, was born at Worcester, where his father, of the same name, was an attorney in good practice. The year of Somers's birth is supposed to have been 1650; but some accounts make it to have been 1652. The father died in 1681, and left his son a small estate in Gloucestershire. It is said that he was first placed at the cathedral school of Worcester, and afterwards at a private school.

Somers was entered at the Middle Temple, and in 1676 was called to the bar. He was also a member of Trinity College, Oxford, where he resided, it is said, five or six years, after taking his bachelor's degree. It was during this period that he produced his principal literary performances. He contributed to the English translation of 'Plutarch,' published by Tonson, a translation of the life of Alcibiades; and poetical versions of Ovid's Epistles of 'Dido to Æneas' and 'Ariadne to Theseus,' to Tonson's edition of 'Ovid's Epistles,' in English. He also wrote 'A Brief History of the Succession of the Crown of England,' 'The Security of Englishmen's Lives, or the Trust, Power, and Duty of the Grand Juries of England,' &c., and other papers.

Somers, whose ability and professional learning were well known to a circle of friends, came up to London in 1682, and commenced practice at the bar. The first cause of public importance in which he was engaged was the prosecution of Pilkington and Shute, sheriffs of London, and other members of the Whig party, who were tried and convicted, in May, 1683, for a riot at the last election of sheriffs, in which he appeared as junior council to his friend Winnington for the defendants. The circumstance of his being selected as one of the counsel at the trial of the Bishops in the Court of King's Bench, in June, 1688, brought him prominently before the public. He was selected, it is stated, on the strong recommendation of Mr. Pollexfen, one of the leading counsel for the bishops. 'I have heard one of the bishops declare,' says Bishop Kennett in a note to his 'Complete History,' 'that objection was made among themselves against Mr. Somers as too young and obscure a man; but old Pollexfen insisted upon him, and would not be himself retained without the other; representing him as the man who would take most pains, and go deepest into all that depended on precedents and records.' Somers' speech occupies only about a column in the 'State Trials' (vol. xii. p. 396); but it is probable that his seniors were indebted for much of their matter to his learning and research.

From this time Somers is to be regarded as one of the leading political persons of his time. He is said to have been associated with Shrewsbury and other chiefs of the Whig party in the negociations and arrangements which resulted in the coming over of the Prince of Orange; and he was taken into the confidence of William from the first. He was returned as one of the representatives for Worcester to the Convention, which met in January, 1689; and he took a distinguished part in the debates in the Commons and the Conferences with the Lords, which terminated in the adoption, by both houses, of the decisive resolution that the late king had 'abdicated' the government. Somers indeed was a member of the first and chairman of the second of the two committees which prepared the Declaration of Right.

Under the new government preferment flowed fast upon Somers. In the beginning of May, 1689, he was made solicitor-general and knighted; on the 2nd of May, 1692, he was made attorney-general; and on the 23rd of March, in the same year, he was promoted to the office of lord-keeper of the great seal. This last appointment, of course, though he was not yet raised to the peerage, removed him both from Westminster Hall and from the House of Commons. The most remarkable occasion on which Somers distinguished himself while holding the office of lord-keeper, was what is called the case of the Bankers in the Court of Exchequer, in 1696. He delivered a judgment against the bankers, and reversed the decision of the Barons of the Exchequer; but the judgment of Somers was reversed by the House of Lords. In 1697 Somers was made lord chancellor, and was raised to the peerage. As he was considered one of the king's strongest friends, he was attacked by the Tory opposition. On the 10th day of April, 1700, the day before the king came down to prorogue the parliament, a motion was made that his Majesty should be addressed to remove Somers from his presence and councils for ever. But this attempt failed. Immediately before this, the bill for resuming the king's Irish grants had been carried through both Houses, in spite of the most strenuous opposition by the court, and the determination which William was at one time understood to

have come to rather to risk everything than to give his consent to the measure. During the debates about the bill Somers was ill, and the worst construction was put on his absence. Lord Hardwicke says that in consequence of his absence King William was angry with him. At any rate he resolved to get rid of a man who was so obnoxious to the Commons. On the 17th of April the king took the great seal from him.

But his ejection from office neither saved Somers from the enmity of the Commons, nor lost him the favour and confidence of the king. In the new Parliament, which met in February, 1701, the Tories found themselves in a majority in the Lower House; and they had not sat long before they proceeded to direct their power against the chief of the king's friends and ministers, the Duke of Portland, Lord Somers, the Earl of Oxford, and Lord Halifax, all of whom it was resolved to impeach. The resolution to impeach Somers was carried on the 14th of April, by a majority of 198 to 188, after he had come down to the House, and been heard in his own defence. The principal, and indeed at this stage of the proceeding, the only crime laid to his charge, was his conduct respecting the two treaties for the partition of the Spanish monarchy, which had been negociated in 1698 and 1699 by King William, without consulting with his ministers, and for which Somers had forwarded, at the king's desire, the necessary powers in blank under the great seal. We suppose there can be no question but that, according to the modern practice of the constitution, no minister would be held to be justified in acting as Lord Somers admitted he had done in this case. The precise charges against Lord Somers too, as stated in the resolution for impeaching him, was, that he had advised his majesty to the treaties; and that certainly was not and could not be made out, being in truth contrary to the fact. Afterwards fourteen distinct articles of impeachment were drawn out and sent up to the Lords. The most remarkable of the charges brought against him related to various personal grants of land and money which he was asserted to have begged and obtained from the crown — 'many great, unreasonable, and exorbitant grants,' as they were styled, 'of several manors, lands, tenements, rents, hereditaments, and revenues,' besides the annual salary, or pension (as it is called), of 4000*l.*, which, 'through his Majesty's most abundant grace and bounty,' he had received during all the time he was lord keeper and lord chancellor, over and above 'the fees, profits, and perquisites of or belonging to the great seal, established by law as a sufficient and ample recompense and reward for the faithful discharge of that high station.' The affair ended after many messages and conferences between the two Houses, by the Commons declining to appear to prosecute their impeachment on the day appointed by the Lords, under the pretence that the Lords had refused them justice in the matter; on which their Lordships pronounced him acquitted, and dismissed the impeachment. (See Howell's 'State Trials,' xiv. 311.)

The speech with which William opened his last

parliament, on the 31st of December, 1701, called by Burnet 'the best speech that he, or perhaps any other prince, ever made to his people,' was written by Somers. Lord Hardwicke mentions that he had seen the original in Somers's handwriting.

In 1702 Somers, unoccupied by the cares and toils of office, was elected president of the Royal Society. In 1706 he introduced and carried through parliament a bill 'for the amendment of the law, and the better advancement of justice,' which, although deprived of some useful clauses by the Commons, corrected various abuses in the courts both of Chancery and of Common Law. He also took a leading part in the discussion and arrangement of the great measure of the Union with Scotland.

On the return of his party to power in 1708, Somers was made president of the council; and he held that office till the recovery of the cabinet by Harley and the Tories in 1710. He succeeded in making himself very acceptable to Queen Anne, notwithstanding her original prejudice against him.

Somers continued to take part occasionally in the debates of the House of Lords after his second dismissal from office; but the infirm state of his health is said by some to have somewhat affected his intellect. In 1713 we find him joining in support of the factious motion brought forward by a section of the opposition, for leave to bring in a bill to dissolve the Union. He resumed his place at the council-board after the accession of George I.; but his faculties were now almost gone. It is related however that he took an interest in the progress of the Septennial Bill, which he declared 'he thought would be the greatest support possible to the liberty of the country.' A stroke of apoplexy occasioned his death, on the 26th of April, 1716. Lord Somers was never married. His estates descended to the family of his sister, who was married to Charles Cocks, Esq., M.P., whose grandson, the father of the present Earl Somers, was created Baron Somers in 1784.

The character of Lord Somers has been elaborately drawn by Addison in one of the numbers of the 'Freeholder' (published 14th May, 1714), but with considerable wordiness, and something perhaps of the air of insincerity which commonly attaches to a formal panegyric. He had been an early and zealous patron of Addison, who obtained his notice by inscribing to him his early poem on the campaigns of King William, and who afterwards dedicated to him his 'Travels in Italy,' and the first volume of the 'Spectator.' There is much more force in the more shaded picture of him which Swift has given in his 'History of the Four Last Years of Queen Anne;' nor perhaps, taken with the proper allowance, does it convey a less correct notion of the man.

The collection commonly called the 'Somers' Tracts,' which has been twice printed, first in 1748, in 16 volumes, 4to., secondly in 1809-15 in 13 volumes, 4to, under the superintendence of the late Sir Walter Scott, consists of scarce pamphlets selected, as the title intimates, principally from the library of Lord Somers.

SOMERSET, DUKE OF. [EDWARD VI.]

SOMERSETSHIRE, an English county, is bounded N. and W. by the Bristol Channel, N.E. by Gloucestershire, E. by Wiltshire, S.E. and S. by Dorsetshire, and S. and W. by Devonshire. The greatest length E. by N. to W. by S. is 70 miles; the greatest breadth at right angles to the length is 40 miles. A small detached portion of the county is entirely surrounded by Dorsetshire: it lies between Sherborne and Blandford. The area is 1645 square miles. The population in 1841 was 435,982.

Surface, Geology, and Coast-line.—Somersetshire is a hilly country; but the ranges of hills are separated by low marshy flats; so that, hilly as it is, it yet exceeds most counties in the extent of its fens. The north-eastern part is occupied by the eminences round Bristol and Bath, through which the Avon makes its way. These eminences are irregularly grouped, and extend along the north-eastern border, from Pill on the Avon below Bristol into Wiltshire: many of the valleys or 'combes' which separate the hills are drained by small streams which flow into the Avon. The principal summits in this part of the county are from 700 to 800 feet high.

The summits of the hills in the immediate neighbourhood of Bath are of the oolitic formations. The great oolite, the most important of these, which furnishes the fine-grained freestone commonly known as Bath Stone, has a thickness probably of 130 to 150 feet. Masses of this rock are found scattered on the slopes of the hills which it crowns, covering the subjacent clays and fullers' earth, which, with the inferior oolite and calcareous sand, constitute the lowest members of the oolitic group, and form a terrace projecting into the subjacent valleys, beyond the great oolite and connected rocks which crown the summits of the hills. The inferior oolite is extensively quarried in Dundry Hill, where it yields a good freestone.

The valley of the Avon, and the other valleys which separate these hills, and are drained by streams flowing into the Avon, are occupied by the formations of the red marl or new red sandstone group. In some places the newer magnesian or conglomerate limestone, which underlies the new red sandstone, rises to the surface.

The coal-measures, mountain limestone, and old red sandstone belong to the carboniferous group of the Somersetshire and South Gloucestershire coalfield, and occupy the northern part of the county extending to the Mendip Hills, though covered in most places by more recent formations. In this field are numerous coal-pits.

The eastern side of the county, extending from Bath by Frome, Bruton, and Castle Cary to Yeovil, and the southern side, from Yeovil by Ilminster to Wellington, are occupied by hills of similar geological character to those around Bath, and unite with them in the neighbourhood of that city. The lower slopes, with some outlying eminences or ranges projecting to the west or northwest, consist of lias, upon which rest the lower oolitic formations, and upon these again the great oolite, with its connected beds. This range is divided into detached parts by the transverse valleys of the Brue, the Yeo or Ivel, the Parret, and the Ile; and that portion which lies west of Ilminster overlooks to the north the vale of Taunton, which is occupied by the new red sandstone, and is watered by the Tone.

The Mendip Hills are a distinct range stretching from W. by N. to E. by S., and separated from the hills about Bath and Bristol by the narrow valley of the Yeo, a small stream which flows into the Bristol Channel near Weston. They extend at their western end to the coast, and unite at their eastern extremity with the hills near Frome. The length of the Mendip Hills may be estimated at 25 miles, their breadth between at 6 or 7 miles. This chain consists of a central axis of old red sandstone, flanked on its opposite declivities by parallel bands of mountain limestone. The cavern of Wokey Hole, and the defile of Cheddar Cliffs, with its long line of stupendous mural precipices, certainly among the most magnificent objects of this kind in Britain, are the well-known features of this chain. The mineral treasures of the Mendip Hills are important. Zinc and calamine are obtained abundantly in the central and western part of the range. There are numerous coal-pits in the villages which lie north-west of Frome. The coal seams are all thin; hardly any exceed three feet. The Mendip Hills rise in some parts to more than 1000 feet.

The long low ridge of Pawlet or Polden Hill and the connected hills is an offset from the eastern hills between Castle Cary and Ilchester. It extends about 20 miles in a direction parallel to the Mendips, from which it is separated by a wide intervening fenny flat, drained by the Brue.

In the western part of the county, running north-west from the neighbourhood of Taunton to Bridgewater Bay in the Bristol Channel, are the Quantock Hills. They consist of an elevated mass of a coarse gritstone, and belong to the slate formation which overspreads the north of Devonshire, separated however from the principal slate district by an intervening tract of new red sandstone, which formation nearly surrounds the foot of the range. The length of the Quantock Hills is about 14 miles. Their greatest breadth is about 5 or 6 miles. Will's Neck, one of the highest summits, is 1270 feet high.

The greater part of the county west from the narrow tract of new red sandstone which separates the Quantock Hills from the principal district of the slate rocks, is occupied by an irregular hilly district, forming part of the wild moorlands of Exmoor Forest, extending into the two counties of Devon and Somerset. It is chiefly occupied by the slate rocks of the Devonian range. Dunkerry Beacon, the highest summit, is 1668 feet high.

There are mineral springs at Bath, Glastonbury, Alford, near Castle Cary, and Queen Camel, near Ilchester. Most, if not all of these, are found in a stratum of marl between the lower oolite and the lias formations.

The coast from the mouth of the Avon runs 15 or 16 miles S.W. to Sand Point; thence 5 miles S. to Brean Down, a hill of mountain limestone, precipitous on every side, and surrounded by the sea

except just at its eastern end, where a marshy flat connects it with the mainland. From Brean Down the coast extends S.W. 10 miles to Little Stoke Point, including Bridgewater Bay. From Little Stoke Point, which is the extremity of Bridgewater Bay, the coast runs W. 25 miles to the boundary of the county. Much of the coast is flat, but in some parts there are cliffs as between Portishead and Clevedon, and where the cliffs of the Quantock range reach the coast W. of Little Stoke Point. These cliffs sometimes rise to the height of 100 feet or even 200 feet.

Rivers, &c.—The general direction of the rivers is to the north-west: the only material exception is in the case of the Tone and the upper part of the Bristol Avon. The larger rivers (except the Tone) rise in the adjacent counties, and pass through the depressions which break the continuity of the bordering hills.

The Avon, distinguished from the Warwickshire river so called by the title of the Lower Avon, rises in Gloucestershire, on the eastern slope of the Cotswold Hills, and flows through Wiltshire to Bradford, below which it reaches Somersetshire, separating it from Gloucestershire. It has a course, on or within the border of the county, of 31 miles into the Bristol Channel or æstuary of the Severn. From Bath it flows N.N.W., having a winding course between the oolite and mountain limestone hills of the north-eastern border. It is navigable up to Bath (where the Kennet and Avon canal locks into it) for barges, and to Bristol for sea-borne vessels, the largest class of which, owing to the great rise of the tide, reach the quays of the town without any difficulty, though it is eight miles, following the winding of the channel, above its mouth. At the mouth of the Avon the spring tides usually rise 40 feet, and have been known to rise 50 feet. The Avon receives the Frome, the Midford Brook, above Bath, and the Chew at Keynsham. The Frome joins the Avon between Bradford and Bath.

The Avon is connected with the Thames by the Kennet and Avon Canal, of which a portion is in this county. It enters by the Dundas Aqueduct over the Avon, and then follows the valley of that river to Bath.

The Yeo, or Yow, rises at Compton Martin on the northern slope of the Mendip Hills, and flows N.W. 13 miles between them and Broadfield Down into the Bristol Channel.

The Axe rises in Wookey Hole, on the southern side of the Mendip Hills, and flows N.W. 21 miles through the flats at their foot; it is navigable to the village of Lower Weare, near Axbridge, about 11 miles above its mouth, but this distance has been shortened to 9 miles by one or two cuts.

The Brue rises on the slope of the chalk marl and green-sand hills, on the border of Somersetshire and Dorsetshire, and flows westward by Bruton and Glastonbury, 35 miles through the marshy flat between the Mendip Hills and the Polden Hills into the æstuary of the Parret. It is not navigable. The navigation from Glastonbury to the Brue is by a canal running nearly parallel to the river.

The Parret, the principal river in the county, rises in the chalk downs at South Perrot, north of Beaminster, in Dorsetshire. It reaches the border of Somersetshire about a mile from its source, and flowing N. for 15 miles, traverses the oolitic border-hills by a depression near Crewkerne, and passes by South Petherton to Langport, receiving the Ile on its left bank, and the Yeo on the right. From Langport the Parret flows N.W. 12 miles, through a marshy flat to Bridgewater, receiving midway between that town and Langport the Tone on the left bank. Below Bridgewater the Parret has a winding course of 16 miles into Bridgewater Bay, in the British Channel, receiving the Cary on its right bank, and uniting just at its outfall with the Brue. The whole course of the river is thus about 43 miles.

The Ile rises in the slope of an outlying chalk hill between Chard and Crewkerne, and flows N. and N.E. 15 or 16 miles into the Parret, through marshes which cover the lias formation. It passes near Ilminster, but not through it.

The Yeo, or Ivel, rises amid the border-hills near Milborne Port; and flows S. and S.W., and then N.W. 11 miles, through a valley amid the oolite hills, past Sherborne in Dorsetshire to Yeovil, receiving several streams from the Dorsetshire chalk downs on the left bank. From Yeovil it flows 8 miles in a circuitous course N.N.W. to Ilchester, and thence 7 miles W.N.W., making 26 miles in all, into the Parret at Langport. All this part of its course is through marshes, which cover the lias and new red sandstone formations.

The Tone rises in the southern slope of Brendon Hill, and flows 10 miles S. to the border of Devonshire. It then turns E., and flows 23 miles past the town of Taunton into the Parret.

The Cary rises near Castle Cary, and flows W. to the Parret; its whole course is about 30 miles.

The Yeo is navigable for 7 miles into the Parret at Langport. A little above Langport the navigation of the Parret commences, and continues to the mouth of that river. Ships of 200 tons can get up to Bridgewater. The Tone is navigable from Taunton to its junction with the Parret, 10 or 11 miles. The Cary is not navigable.

The river Exe has its source and the upper part of its course in the western extremity of Somersetshire, to which some of its first affluents belong, but this river belongs chiefly to Devonshire.

The Great Western Railway enters the county near Bath, and runs by Bath to Bristol, where it is connected with the Bristol and Exeter Railway. There are short branches to Clevedon and Weston.

Agriculture.—Somersetshire possesses a soil and climate well suited to the growth of wheat and all the agricultural produce usually raised in any part of England. The hills are mostly cultivated or in profitable pasture. There is a fair proportion of woodland without any extensive forests. In some of the vales, such as the extensive vale of Taunton, the soil is of a rich nature, and the wheat which is produced there is of superior quality. Excellent butter and cheese are made where the land is better adapted to pasture.

The Cheddar cheese, which, from its superior quality, gives its name to a great portion of the cheese made in the county, is reckoned by many to be the best cheese made in England from pure milk without any addition of cream: the real Cheddar cheese is consequently scarce, and bought up as soon as it is made.

The cows are mostly of the Devon breed; but many short-horns are also to be found in the dairies. The oxen fatted are either Devons or Herefords and short-horns. The sheep on the best lands are of the Leicester or South Down breeds, with crosses between these and the Cotswold sheep, which increases their size.

There are a few hops grown in the county, but no very extensive hop-gardens; nor is there much cider made, although there are some good orchards.

Many hogs are fatted, and very good bacon is cured; the breed of pigs is like the Hampshire and Berkshire, which have of late years been improved by crosses with the Essex and Neapolitan breeds.

The farm horses are generally strong and active; and although some heavy waggons and old-fashioned ploughs are still met with, light carts and ploughs begin to be appreciated and gradually supersede the old implements.

Divisions, Towns, &c.— Somersetshire is divided into 40 hundreds. It constitutes the diocese of Bath and Wells, and is divided into three archdeaconries. It is in the Western Circuit. The spring assizes are held at Taunton; the summer assizes at Bridgewater and Wells alternately. For parliamentary purposes it is divided into East Somersetshire and West Somersetshire, each of which returns 2 members; in addition to which, Bath, Wells, Bridgewater, and Taunton, return each 2 members, and Frome returns 1 member: total, 13 members.

The following are the principal towns, with the population of each in 1841:—

Axbridge, a market-town, 10 miles N.W. from Wells, is situated a short distance from the northern bank of the Axe. It is a small place, consisting of a single street. The church is ancient, and has a lofty western tower. Population of the parish, 1045.

Bath is the capital of the county. [BATH.]

Bedminster, on the south side of the Avon, is a suburb of Bristol. Population of the parish, 17,862. The whole of what is properly Bristol is in Gloucestershire. [BRISTOL.]

Bridgewater. [BRIDGEWATER.]

Bruton, a market-town, 32 miles E. by N. from Taunton, stands on the right bank of the Brue, which is here a small stream crossed by a stone bridge, and comprehends one main street, clean and well paved, with neatly-built houses, and several smaller streets. The church, which is on the left bank of the river, is large, partly of decorated English partly of perpendicular architecture, with a pinnacled tower at the west end. The town-hall contains a court-room, used for petty sessions; the lower part is used as a market-house. Population of the town, 1885.

Castle Cary, a market-town, is 28 miles E.N.E. from Taunton. The principal street extends near a mile on the road to Ilchester; the houses are straggling, but neatly built. The small village of Almsford is so near as almost to form part of the town. Castle Cary church is handsome, and on an elevated site; it has an embattled western tower. Population of the parish, 1776.

Chard, a market-town and municipal borough, 13 miles S.E. from Taunton, stands on the high ground on the south border of the county, and consists of several streets irregularly laid out, and lighted with gas; the houses are generally well-built. The church is large and handsome, with a low tower at the west end. The market-house, formerly used as the borough court-house, is an ancient building; as is the present town-hall, formerly a chapel. The corporation consists of 4 aldermen and 12 councillors. Population of the borough, 2877.

Cheddar, formerly a market-town, now a village, 8 miles N.W. from Wells, is situated at the foot of the Mendip Hills. The rich pasturage of the neighbourhood has rendered its dairies long celebrated for the production of excellent cheese. Population of the parish 1866.

Crewkerne, a market-town, 19 miles S.E. from Taunton, consists of several streets meeting in the market-place, in the centre of which is a commodious market-house; the houses are generally well-built. The church is large, with an embattled tower, rising from the intersection of the nave and transepts. It is lighted with large windows of perpendicular character. Population of the town, 3673.

Dulverton, a market-town, 24 miles W. from Taunton, stands in a deep valley, watered by the Barle (a feeder of the Exe), over which there is a stone bridge of five arches. The town consists of two well-paved streets, with channels of water running through them: the houses are mostly well-built. The church is an ancient building, with an embattled tower, 60 feet high, at the west end. Population of the parish, 1422.

Dunster, a small market-town, 21 miles W.N.W. from Taunton, stands at the eastern foot of Grabbist Hill, at the end of a narrow valley, which here opens upon the Bristol Channel, the shore of which is a mile N.E. of the town. A small stream which drains the valley runs near the town, and is crossed by a stone bridge of three arches. There are two principal streets, at the end of one of which is the castle, a building of the Elizabethan period, having behind it a richly-wooded park, which commands a beautiful and extensive prospect. The church, built in the reign of Henry VII., is handsome and spacious, with a central tower. There is an old market-house. Population of the town, 739.

Frome, a market-town and parliamentary borough, 12 miles S. from Bath, is situated on the western side of the river Frome, over which is a good stone bridge. The town is irregularly built, and the streets, except one, which is the great thoroughfare, are narrow and indifferently paved, but lighted with gas. There are several large establishments for the manufacture of woollen cloth.

There is a good market-house of modern erection. The parish church is handsome and spacious, with an embattled tower, surmounted by a spire. There is a free grammar-school of the foundation of Edward VI. The borough returns 1 member. Population, 9699.

Glastonbury, a market-town and municipal borough, 22 miles E.N.E. from Taunton, stands on an eminence which is nearly insulated by the surrounding marshy flats. The town consists of several streets: four of these include a quadrangular space, in which the ruins of the abbey of Glastonbury are comprehended; and from the corners of this quadrangle other streets extend. The houses are generally low, and many of them have been built with the stones taken from the ruins of the abbey. The remains of this once splendid structure consist of some fragments of the church, the chapel of St. Joseph of Arimathea, and what is called the abbot's kitchen. The ruins of the church comprehend two of the pillars which supported the central tower, some portions of the walls of the choir, and a fragment of the wall of the nave. The architecture belongs to the period of transition from the Norman to Early English, with some portions of later date. The whole length of the church was 380 feet. Glastonbury has two parish churches, both elegant structures in the perpendicular style, with graceful towers; and in the town are several buildings, which were formerly dependencies of the abbey. The abbey of Glastonbury was very extensive and rich, and at the time of the Norman Conquest the abbot was an important person in the kingdom. The last abbot, Richard Whiting, opposed the suppression of the abbey by Henry VIII., and was, on a charge of embezzlement, tried and hanged on the adjacent Tor Hill, in 1539. The municipal borough is governed by 4 aldermen and 12 councillors. Population of the town and parish, 3314.

Ilchester, or *Ivelchester* (from the river Ivel or Yeo, on which it stands), a market-town, 22 miles E. from Taunton, by Langport, stands in a rich valley, and may be considered as consisting of two parts, Ilchester proper and the village of Northover; these are separated by the river Yeo, which is crossed by a stone bridge of two large arches. Ilchester proper consists of four streets of indifferently-built houses. The church is an ancient building, with a low octagonal tower. The county gaol, which is still at Ilchester, though the assizes are no longer held here, is a spacious building of freestone. The town-hall is a neat modern building at one end of the market-place. Population of the parish, 1068.

Ilminster, a market-town, 12 miles S.E. from Taunton, is in a low but pleasant situation, about a mile distant from the river Ile, from which it derives its name. It consists principally of two streets forming a cross. The houses are neat and well built. The church is large and ancient, with a central tower of light and peculiar construction. Population of the parish, 3187.

Langport, a market-town, 13 miles E. from Taunton, is situated at the junction of the Yeo and Parret, and is on the slope and at the foot of the hills which overlook the marshy flats adjacent to those rivers. The principal street leads down the hill to the Parret, over which is a handsome bridge of three arches, erected in 1840–1. There are several other bridges or arches, either over arms of the river, or designed to allow a passage to the waters in the time of floods. The town is well lighted with gas, and paved throughout. A small part of the town lies west of the Parret, and is called Langport Westover, to distinguish it from the principal part, which is called Langport Eastover. The church is ancient, with a western tower. There is a neat guildhall. Population of the parish of Langport Eastover, 1172.

Milborne-Port, a market-town, 34 miles E. by S. from Taunton, is pleasantly situated in a valley near the sources of the Yeo. It consists chiefly of detached houses, and is irregularly built. The church is a large cross church, with a square tower. There is an ancient town-hall, with a curious Norman doorway. Population of the parish, 1740.

Milverton, a market-town, 8 miles W. from Taunton, is situated in a valley drained by a feeder of the Tone, and surrounded by wooded hills. It consists principally of three streets, irregularly laid out. The church is a spacious building in the perpendicular style. Population of the parish, 2154.

Minehead, a market-town, 23 miles W.N.W. from Taunton, consists of three parts: the Upper Town, comprehending the church and some streets of mean houses, irregularly laid out, on the eastern slope of Greenaley Hill; the Lower Town, which is the principal part, and has some respectable streets; and the Quay Town, along the shore of the British Channel. The church is large and handsome, with an embattled tower, 90 feet high, at the west end. At Quay Town is a quay, faced with masonry. There is also a custom-house. Population of the parish, 1266.

South Petherton, a market-town, 17 miles S.E. from Taunton through Ilminster, is situated about a mile W. from Petherton Bridge, a stone bridge of three arches over the Parret. It consists of several streets and lanes irregularly laid out. The church has a plain octangular tower at the intersection of the transept. Population, 1971.

Shepton Mallet, a market-town, 32 miles E.N.E. from Taunton, is situated in a valley watered by a small feeder of the Brue, and consists of several streets, irregularly laid out; the principal street is broad and well-built, and is paved and lighted. The church is large and handsome, with a tower at the west end crowned with a spire. The county bridewell is at Shepton Mallet, and there is a union workhouse. In the market-place is an ancient market-cross. Population, 4831.

Somerton, a market-town, 17 miles E. by N. from Taunton, stands on a hill on the left bank of the Carey, over which is a stone bridge, and consists of about five narrow streets. The church is ancient, with an octangular embattled tower on the south side. Population of the parish, 1981.

Taunton. [TAUNTON.]

Watchet, a market-town, 29 miles N.W. from Taunton, stands on the coast of the Bristol Channel, and is at the mouth of a small rivulet: cliffs extend along the coast on both sides of the town,

which consists of four streets, mostly paved. The parish church of St. Decuman's is in the village of that name, about a mile S. from the town, and is a large handsome church, with an embattled western tower 80 feet high. Population of the town, 916.

Wellington, a market-town, 7 miles S.W. from Taunton by the railway, is situated on high ground about 1½ mile S. from the Tone, and consists chiefly of two streeets intersecting in the middle of the town. Considerable improvements have been made of late years by paving the streets and removing old houses. The church is a fine gothic building, with a handsome embattled western tower, crowned with twelve pinnacles. The Duke of Wellington derives his title from this town, and he is Lord of the Manor of Wellington. A pillar in commemoration of the battle of Waterloo has been erected in the neighbourhood. Population of the town, 3305.

Wells. [WELLS.]

Wincanton, a market-town, 35 miles E. from Taunton by Langport and Ilchester. It is called Wincaleton in 'Domesday Book,' a name embodying that of the river Cale, an affluent of the Dorsetshire Stour, on which it stands. The town consists of four principal streets. The houses are commonly well built and regular, which is partly owing to their having been rebuilt after an extensive conflagration in 1747. The church is a tolerably large and plain building, with a western tower. Population of the parish, 2296.

Wiveliscombe, a market-town, 12 miles W. from Taunton, is situated in a valley, or combe, enclosed by hills on all sides except the S.E. It is irregularly laid out, but consists for the most part of neat and well-built houses. The church has a western tower, surmounted by a spire. Population of the parish, 2984.

Yeovil, a market-town, 26 miles E. by S. from Taunton, stands near the river Yeo. The town consists of a number of streets and lanes irregularly laid out, paved, and lighted: some of the streets are spacious, and have good houses of brick or stone. The church is a handsome building of perpendicular character, with a large plain western tower 90 feet high. There is a union workhouse. Population of the town, 6302.

History and Antiquities.—In the earliest historical period this county is thought to have been inhabited by the Belgæ. This nation appears to have possessed the greater part of the counties of Hampshire and Wiltshire, and was subdued by Vespasian during the command of Aulus Plautius, in the reign of Claudius. In the Roman division of the island Somersetshire was included in the province of Britannia Prima.

Roman antiquities have been found in considerable abundance at Bath, at Ilchester, at Yeovil, and elsewhere. There are several Roman camps and other ancient forts or camps scattered throughout the county. Of what are usually regarded as Druidical antiquities Somersetshire possesses but few. The principal is at Stanton Drew, east of the road between Bristol and Wells: it consists of four groups of stones, forming (or rather having formed, when complete) two circles; and two other figures, one an ellipse. Some of the stones are 9 feet high, 22 feet in girth, and 15 tons weight.

In the Saxon invasion, this county was the scene of many battles. Alfred, when driven from his throne, found security in the marshes of the Isle of Athelney, at the junction of the Tone and Parret. Sweyn, king of the Danes, was at Bath with his army (in 1013); and all the west country submitted, and gave hostages to him there. In 1067, the year after the battle of Hastings, a son of Harold came with an army and fleet to the mouth of the Avon, and plundered part of the county. During the West Saxon, Anglo-Saxon, and Anglo-Danish dynasties, Somerset was, for at least a great part of the time, a county.

Of the middle ages there are several memorials, especially monastic ruins, some of which are at Bath, and others at Glastonbury, Ilchester, Banwell, Old Cleeve, and other places. The only important castellated remains are Farleigh or Farley Castle, between Bath and Trowbridge in Wiltshire; Nunney, near Frome; and Walton Castle, near Clevedon. The ruins of Farleigh are very picturesque. There are some remains of Bridgewater and Taunton castles.

In the civil war of Charles I. some severe battles were fought in this county, especially at Taunton. Somersetshire was the principal scene of Monmouth's rebellion in 1685 against James II. The most fearful severities followed the suppression of this rebellion. The Earl of Feversham hanged 22 men at Bridgewater on the evening of the last battle, July 6, without any form of trial. A special commission, with Lord Chief Justice Jeffreys at its head, was sent into the West; and a great number of persons were condemned and executed at Dorchester, Exeter, and especially Taunton and Wells. The prisoners for trial in this county alone were above 1000, and of these at least 240 were executed. The sentences were carried into effect in 36 different towns and villages, among which they were distributed.

SOMERTON. [SOMERSETSHIRE.]

SOMERVILLE, WILLIAM, was born in 1692, at Edstone, in Warwickshire, which had been the residence of his ancestors for some centuries. He studied at Winchester School, and at New College, Oxford. Having completed his education, he resided during the rest of his life in the family mansion, partly occupied with the duties of a justice of peace, partly with the active pleasures of the sportsman, and partly with the cultivation of his poetical talents. He died, July 19, 1742, and was buried at Wotton, near Henley-in-Arden, Warwickshire.

Somerville's 'Chase' is still a favourite with those who combine a taste for poetry with an attachment to the sports of the field, and has been frequently reprinted. His other poems consist of 'Field Sports,' 'Hobbinol, or Rural Games,' Fables, Tales, and lyrical pieces.

SOMERVILLITE (*Humboldtilite*) occurs crystallised. Primary form a square prism. Colour pale dull brownish-yellow. Transparent, translucent. Found in the cavities of matter ejected from Vesuvius. Analysis:—Silica, 43.06; lime,

31.67; magnesia, 8.83; alumina, 0.50; protoxide of iron, 2.00.

SOMMA. [NAPLES, Province.]

SOMME, River. [SOMME, Department.]

SOMME, a department in France formed out of the province of Picardie, is bounded N. by Pas-de-Calais, E. by Nord and Aisne, S. by Oise and Seine-Inférieure, and W. by the English Channel. Its greatest length is about 80 miles, and its greatest breadth about 47. The area is 2371.86 square miles, and the population in 1846 was 570,529, which gives 250.54 to the square mile, being 76.79 above the average per square mile for the whole of France.

The coast-line of the department, extending about 25 miles between the mouths of the Anthie and the Bresle, is broken into two parts by the æstuary of the Somme, to the north of which the land, consisting of alluvial soil, lies low, and is protected from the sea by a series of sand hills; while to the south of it commences the range of high chalk cliffs that extends along the southern coast of the Channel as far as Havre.

The surface of the department may be described as a great plain sloping from S.E. to N.W.; it is for the most part level, but in the north of the department, along the left bank of the Somme in the neighbourhood of Abbeville, and at some other points, there are hills of considerable height. The wide treeless plains are here and there furrowed by valleys watered by small streams, and presenting green meadows and trees. The principal forests are in the north and south of the department, but none of them is of great extent. The soil consists mostly of a sandy clay resting upon chalk, and is not naturally very fertile; nevertheless a great weight of grain is raised. The fields generally are not divided by hedgerows; and in many parts the country presents a most monotonous appearance even in summer from the prevalence of corn crops, which may be seen growing continuously for miles, the scenery undistinguished and unvaried by any object natural or artificial, unless it be by the scarecrow or by the cider apple-trees that everywhere fringe the road. The valleys (especially that of the Somme) contain marshes, and generally peat also, whence turf fuel is dug, the necessity for which will be understood from considering the small extent, and in most instances the great distance of the forests.

The products include all the common cereal grains (of which a considerable surplus is exported), oleaginous seeds, beetroot, pot-herbs, hops, dyeing and medicinal plants, grass seeds, and apples for making cider and beer, which are the chief beverages of the inhabitants. The breadth of land under meadow and green crops is on the increase; there is no great extent of natural pasture, yet a large number of useful farm-horses, horned cattle, and pigs are reared. Poultry is abundant and excellent. Sheep are not very numerous, and those that exist are for the most part ill-fed and lean, but their wool is said to be pretty good. A great deal of hemp and flax is grown in the north of the department. The Santerre district south of the Somme, between Péronne, Montdidier, and Amiens, is a fine wheat country. The climate resembles that of the south of England, but it is somewhat colder in winter; it is healthy except in the neighbourhood of the undrained marshes in the valley of the Somme.

The minerals are building stone, paving flints, marble, chalk, vitriolic earth, potter's clay, and gypsum; coal has been found near Doullens, but no mines are worked.

The manufactures are important, comprising fine and coarse woollen cloths, cotton fabrics of every description; also silks, linen, lawn, cambric, gauze, cashmere shawls, canvass, furniture cotton, carpets, muslins, hosiery, ropes; locks, hardware, nails, leather, paper, oil, soap, glue, glass, pottery, mineral acids and other chemical products. The department has several bleach works, large cotton mills driven by steam machinery, 23 beet-root sugar refineries, besides numerous dye-houses, oil and tan mills. The commerce in the agricultural and industrial products named above, and in salt, colonial provisions, wine, brandy, coals, raw cotton, sheep and goats' wool, fish, &c., is very considerable.

The department is named from its principal river, the Somme, which rises in the department of Aisne, north-east of St.-Quentin, past which it flows in a south-west direction; a few miles below St.-Quentin it enters the department to which it gives name; through this it flows in a general westerly direction past Ham, Péronne, Amiens, and Abbeville, and enters the English Channel by a wide embouchure below St.-Valery, after a course of about 120 miles. The river is navigable naturally only from Amiens to its mouth; but the navigation has been extended above that city almost to its source by improving the bed of the river, and chiefly by lateral canalization. The Somme canal, or Angoulême canal as it used to be called, joins the St.-Quentin canal, thus giving the department a water communication with the Oise, the Seine, and the Schelde. [AISNE.] Vessels of 150 tons and small steamers sail up the Somme as far as Abbeville; lighters of about 40 tons ply between Abbeville and Amiens. The Avre, which joins the Somme from the left bank at Amiens, is navigable for about 12 miles. The only other rivers worth naming are the Anthie, which forms part of the northern boundary, and the Bresle, which flows between this department and that of Seine-Inférieure.

The department is traversed by 10 national, 8 departmental, and a great number of parish roads. Railroads run from Amiens to Paris, Lille, and through Abbeville to Boulogne.

The surface measures 1,517,991 acres, distributed among 249,963 proprietors, and into 1,664,116 parcels. Of the whole surface 1,177,159 acres are under the plough; 88,134 acres are laid down in grass; 138,203 acres consist of woods and forests; 50,782 acres are occupied as orchards, nurseries, and gardens; 7369 acres are under canals, rivers, and marshes; 20,424 acres are barren wastes; 40,875 are under various kinds of culture; and 43,131 acres are under buildings, roads, streets, &c.

The department is divided into 5 arrondisse-

ments, which, with their subdivisions and populations, are as follows:—

Arronds.	Cantons.	Communes.	Pop. in 1846.
Amiens . .	8	249	188,232
Doullens .	4	88	60,406
Montdidier .	5	144	71,354
Péronne . .	8	179	113,426
Abbeville .	10	171	137,111
Total . .	35	831	570,529

Of the arrondissement of Amiens and of the whole department the chief town is AMIENS. *Airaines*, a town of 2200 inhabitants, 17 miles W. by N. from Amiens, is situated at the junction of three small streams which drive the machinery of 30 mills; 20 of these are oil-mills; coarse woollen cloth, soap, sieves, canvass, and leather are manufactured here. *Corbie*, a station on the railway to Arras, 10 miles E. from Amiens, is situated on the Somme, and has a population of 2745, who manufacture calico, velvet, hosiery, woollen yarn, and mixed fabrics of silk and wool. *Picquigny*, a small place of 1600 inhabitants, and a station on the railroad to Abbeville, 9 miles W. by N. from Amiens, is famous for the murder of William Longsword, Duke of Normandie, in 942, and for the treaty made between Louis XI. and Edward IV., who had an interview on the bridge that crosses the Somme at this place, Aug. 29, 1475. *Villers-Bretonneux*, 12 miles E. from Amiens, is a busy manufacturing town, with 3125 inhabitants. The industrial products are woollen hosiery, flannel, woollen yarn, cravats, cashmere, plush, &c.

The arrondissement of Doullens is named from *Doullens*, a small fortified town, with a tribunal of first instance, and 4294 inhabitants, situated on the left bank of the Anthie, 19 miles N. from Amiens. It is defended by a citadel situated on a hill, and repaired by Vauban. The ramparts of the town afford an agreeable public walk. Besides the citadel, which is one of the finest in France, the only remarkable structure is the church of St.-Martin, a monument of the 15th century. The town trades in corn, oil, hemp, flax, cattle, and canvass woven in the neighbourhood.

The arrondissement of Montdidier has for its chief town *Montdidier*, a wretched collection of old houses placed almost at random on each side of crooked badly-paved streets, 22 miles S.S.E. from Amiens. In this miserable place however there are some remarkable structures, among which must be named the town-hall, the ancient Baillinge, now a court-house, the church of St-Peter, the hospital, and the college buildings, which are very extensive, and contain collections of natural history and antiquities. Montdidier is situated on the slope of a hill above the Dom, a feeder of the Avre, and has tribunals of first instance and commerce, a communal college and 3628 inhabitants. *Moreuil*, a pretty little town, 12 miles by railway S.S.E. from Amiens, on the right bank of the Avre, has a population of 2222, who manufacture cotton and woollen hosiery, paper and nails. *Rosière-en-Santerre*, 14 miles N.N.E. from Montdidier, has 2460 inhabitants. *Roye*, a pretty town on the Avre, 10 miles N.E. from Montdidier, has 3727 inhabitants, who trade in corn and flour. The public square is spacious. The church of St.-Pierre is lighted through fine stained glass windows, representing the coronation of Clovis, Charlemagne, and St.-Louis. There is a curious old wooden house in the square before mentioned, which is said to date from the 14th century.

In the arrondissement of Péronne, the chief town *Péronne*, situated on the slope of a hill, washed by the Somme on the south-west, and surrounded on all other sides by vast marshes, at a distance of 30 miles E. from Amiens, has a tribunal of first instance, a college, and 4132 inhabitants, who manufacture striped and checked cottons, lace, cambric, muslin, and oil. The town is surrounded by ramparts, and defended by a strong castle, which was built in the reign of Henri IV. Péronne, unlike most other French fortresses, can boast of never having been taken. *Albert*, 15 miles N.W. from Péronne, on a branch of the Ancre, which river here forms a pretty cascade, is a station on the Amiens-Arras railroad, and has 3000 inhabitants engaged in the manufacture of linen, cotton, and woollen stuffs; leather, paper, cotton and woollen yarn, and room-paper. In a quarry at this place, a grotto has been discovered containing remarkable petrifactions. *Bray*, a small town of 1500 inhabitants, situated on the Somme, and surrounded by hills, deserves mention as the place to which Philippe-de-Valois retreated after the battle of Crécy. *Ham*, 13 miles S.S.E. from Péronne, stands in a marshy plain near the left bank of the Somme. It is girt by walls now partly in ruins; and defended by a frowning castle flanked with towers, which has long served for a state prison. Here marshal Moncey was confined in 1815 for refusing to sit as judge on marshal Ney; here the ex-ministers of Charles X. were imprisoned; and here prince Louis Napoleon Bonaparte, now president of the French Republic, underwent, for his attempt at revolution in Boulogne, part of his sentence of perpetual imprisonment, from Oct. 6, 1840, till he effected his escape in the guise of a workman, May 26, 1846. The church of Ham, under which there is a curious crypt, is remarkable for its fine bas-reliefs, its organ, and its marble altar, surmounted by a baldaquin.

The arrondissement of Abbeville, is named from its chief town, ABBEVILLE. *Cayeux*, a wretched village on the coast near the mouth of the Somme, has 2796 inhabitants, chiefly engaged in fishing and lock-making. A lighthouse on the cliffs above Cayeux marks the entrance of the Somme. *Crécy*, a small place of 1640 inhabitants, 8 miles N. from Abbeville, gives name to the great victory of Edward III. over the French, Aug. 26, 1346. On the field of battle there is a cross and a windmill, near which Edward is said to have stood during the engagement. *Rue*, 15 miles N.W. from Abbeville near the coast, has a population of 2039, and a remarkable chapel, which has been classed among French historic monuments. *St.-Valery*, on the left shore of the embouchure of

the Somme, which here forms a harbour for vessels of 300 tons, has a tribunal of commerce, a school of hydrography, and 3351 inhabitants, who manufacture ropes and ship cordage, build small ships, and ply the mackerel and herring fisheries in the Channel. The town is an entrepôt for salt, wine, brandy, and divers foreign and native products, and has some coasting trade.

The department forms the see of the bishop of Amiens; is included in the jurisdiction of the High Court and University-Academy of Amiens; and belongs to the 2nd Military Division of which Lille is head-quarters. Under the monarchy it returned 7 members to the Chamber of Deputies; it now has 12 representatives in the Legislative Assembly of the Republic.

(*Dictionnaire de la France; Annuaire pour l'An* 1850; *Paris*, 1850.)

SOMMERS ISLANDS. [BERMUDAS.]

SOMNA'MBULISM, a word of modern origin, which means strictly and etymologically *Sleep-Walking;* it is however generally used in a more extended signification to comprehend all the phenomena that take place when a person, apparently insensible to external objects, acts as if he were in a state of consciousness. Its phenomena may be divided into essential (or proper) somnambulism, which arises from some particular disposition of the nervous system in persons who in other respects apparently enjoy perfect health; symptomatic (or morbid) somnambulism, which occurs in the course of certain diseases; and artificial somnambulism, which is occasioned by the proceedings employed in animal magnetism or mesmerism.

Essential Somnambulism is intimately connected with the subject of sleep and dreaming; and in fact 'a somnambulator,' as Dr. Pritchard says, 'is nothing but a dreamer who is able to act his dreams.' In this state of the system persons are perfectly insensible to external phenomena, but all their functions are obedient to an inward consciousness.

Essential somnambulism occurs in many persons (says Dr. Good) without any manifest predisponent cause, though it is generally connected with a considerable irritability of habit. A morbid state of the stomach, where this habit exists, has very frequently proved an exciting cause; and where this is the case, the attention of the physician must of course be directed to that quarter. With respect to the mode of treatment during the fit, though it has sometimes been recommended to employ violent means, so as to awaken the somnambulist suddenly, and to repeat this as often as the attacks come on, until they have completely ceased; yet M. Bertrand warns us against such a proceeding. 'If, in the first place,' says he, 'sensibility is completely extinguished, all the means employed to awaken the somnambulist will be useless; secondly, even when it is possible to awaken him at once, the sudden shock produces serious consequences; thirdly, as somnambulism is often the result of a salutary crisis of nature, one is never sure of not hurting the patient by suppressing it; and, lastly, the sudden suspension of a habit of the animal economy that has been contracted for a long time, must in all cases be attended with danger.' He adds that the best plan is to try to put oneself in connection with the patient by entering into the course of ideas by which he is occupied during the attack, and so endeavour to direct him in a reasonable manner.

Symptomatic Somnambulism generally presents itself as one of the phenomena attending catalepsy. This form of somnambulism does not appear to have been noticed by the ancients; but there are many cases on record long before the time of Mesmer, as well as others described by persons unacquainted with and even opposed to the doctrines of animal magnetism. In this state persons seem to enjoy a different consciousness to that of health, and under its influence exhibit a variety of phenomena such as those described under ANIMAL MAGNETISM.

SOMNER, WILLIAM, was born at Canterbury, in 1598. He was sent to the free-school of that city, where he acquired a competent knowledge of Latin. He was next placed as clerk to his father in the ecclesiastical courts of the diocese, and afterwards preferred to an office in the courts by archbishop Laud. His natural bent was to the study of antiquities, in which he was encouraged by Dr. Casaubon, one of the prebendaries.

In 1640 he published 'The Antiquities of Canterbury,' 4to., a work which gained him considerable reputation, and which was afterwards reprinted and enlarged by Nicholas Batteley, folio, London, 1703. Somner's next production was an Appendix to the first part (all that was published) of Casaubon's Commentary 'De Quatuor Linguis,' 12mo., London, 1650, showing the relation of the German with the Saxon language. In 1652 he added a most valuable Glossary to Sir Roger Twysden's 'Decem Scriptores.' His Saxon Dictionary was published at Oxford, in folio, in 1659. His last work was a 'Treatise on Gavelkind.' Somner died in 1669. Two of his treatises were published after his death. His books and manuscripts are in the library of Canterbury Cathedral.

SOMORROSTRO. [BASQUE PROVINCES.]

SONCHUS, the name of a genus of plants belonging to the natural order *Compositæ*, suborder *Cichoraceæ*. De Candolle enumerates 45 species, of which four are natives of Great Britain. They are not used in medicine, but some of them are cultivated in gardens. The most common species is the *Sonchus oleraceus*, the common Sow-Thistle. It is found commonly in waste places and cultivated ground all over the world. It has small yellow flowers and a conical involucre when in seed, and is generally fed upon by many animals. *S. arvensis* (Corn-Sow-Thistle) is frequent in corn-fields in this country and the southern parts of Europe, and in Pennsylvania.

SONG, a term applied to either a short poetical or musical composition, but most frequently to the two in union.

As a poetical composition it may, according to Dr. Aikin, 'be largely defined a short poem, divided into portions of returning measure, and turning upon some single thought or feeling.' As a union of the two arts, Rousseau describes Song (*chanson*) as a very brief lyrical poem, to which is added a melody for the purpose of singing it.

As denoting a musical composition Song is used, in this country, to signify a vocal melody of any length or character, and not confined to a single movement; and while the solemn air of the oratorio, and the *aria grande* of the Italian opera, are frequently, though erroneously, so called, the same name is bestowed on the short, simple, unpretending ballad. Of the varieties of Song, see AIR, BALLAD, CANZONET. The term however is not absolutely unlimited in its meaning, for, as regards performance, it is confined to an air for a single voice.

Concerning the *Songs*, or Σκόλια, of the Greeks, see SCOLIA. Of the Roman Song, musically considered, we are without information.

SONGA'RIA is the name of a country in Asia, which constitutes the north-western portion of the Chinese Empire. The name is derived from the Songares, one of the great divisions of the Calmucks or Olöth, who had taken possession of this country, and erected a powerful empire, which was destroyed by the Chinese after the middle of the last century. Songaria lies between 42° and 49° N. lat., and extends from 76° to 95° E. long. In length it extends upwards of 900 miles; but the width varies greatly, and on an average it probably does not much exceed 300 miles. This gives an area of about 270,000 square miles.

Songaria occupies a very remarkable position. It forms the most northern portion of an isthmus, which separates two great wastes, the largest deserts on the surface of the globe, with the exception of the Sahara of Africa. On the east of this isthmus is the Gobi, which, according to a rough estimate, has a surface exceeding 1,200,000 square miles. This desert constitutes an elevated table-land, and is called the Gobi or Shamo. [GOBI.] On the west of the isthmus extends a low desert. This desert, which may be called the Caspian Desert, as it surrounds the sea of that name on the north and east, is even larger than the Gobi, covering an area of nearly 1,300,000 square miles. Both deserts, the Gobi and the Caspian Desert taken together, are equal in extent to the Sahara, and to two-thirds of the surface of Europe.

The isthmus which separates these two large deserts is connected on the south (near 36° N. lat.) with the range of the Hindu Koosh, and on the north (near 53° N. lat.) with the western extremity of the Altai Mountains. South of 40° it lies north and south, and comprehends the countries known under the names of Badakshan and Bokhara. North of 40° it lies south-west and north-east, and comprehends the countries called Kokand and Songaria. South of 40° N. lat. the descent from the elevated Gobi to the low Caspian Desert is formed by an elevated range a great part of which is always covered with snow, and the descent is rapid; but north of 40° N. lat., and especially in Songaria, it is formed by a number of extensive terraces, which, taken together, extend from east to west over a space of 500 miles.

On the east Songaria opens to the Gobi, and on the west to the Caspian Desert; on the north and south it is bounded by two elevated mountain-ranges, the Thian-shan Mountains, and the Altai Mountains. The space between the two ranges is traversed by numerous minor ranges, which lie in every direction, and divide the surface into several river-basins, which are entirely separated from one another, and each of which contains a lake, the receptacle of its drainage. Although such closed river-basins occur in other parts, sometimes in mountain regions, and still more frequently in deserts, they are nowhere so numerous as in Songaria, and they impress on this country a very peculiar character.

The basin of Lake Issikul or Temurtoo occupies the most south-western part of Songaria. The lake is stated to be nearly 100 miles long from east to west, and about 35 miles wide on an average. At no great distance from its shores mountains enclose it on all sides, from which the lake receives a great supply of water. The superabundance is carried off by a river, which leaves the lake at its western extremity. East and north of Lake Issikul is the basin of the river Ili, which falls into Lake Balkash. It is the largest and most important of the basins of Songaria; it extends more than 400 miles east and west, and about 100 miles south and north. Lake Balkash is the largest of the lakes of Songaria, and has no outlet, though it receives several other rivers from the north and east.

In the lake Alakul there is a lofty island called Aral-tube, which is an extinct volcano. Two other extinct volcanoes occur in the Thian-shan mountains. Along the northern declivity of the Thian-shan mountains there are several tracts which are covered with volcanic products, and on which sal-ammoniac and sulphur abound.

Wheat, barley, rice, tobacco, and millet are cultivated. Vegetables are abundant. The lower declivities of the mountains are covered with trees, and likewise the valleys and some parts of the plains, but the greater part of the country is destitute of trees. The most common trees are, pines, mountain-ashes, poplars, willows, lime-trees, and birches. In some parts there are good timber-trees, but in general timber is very scarce.

The herds of the wandering tribes consist of horses, camels, cattle, and sheep. Wild animals are numerous, especially deer. The argali occurs in the northern as well as in the mountainous districts. Wild hogs are extremely numerous in the extensive tracts covered with reeds and canes which surround most of the lakes. Among the minerals are sulphur, salt, iron, and coal.

Inhabitants.—Not a trace of the aborigines of these countries at present exists. We learn from the Chinese historians that the most ancient nations in Songaria belonged to the Caucasian race, but the present inhabitants are Mongols, with the exception of the Khirghis Cossacks. This last-mentioned nation, which at present is nearly in exclusive possession of the western districts, seems to have occupied this part of the country at the time when the Songares were dispersed, after the downfall of their empire. In the other parts of Songaria the different nations of the Olöth or Calmucks form the bulk of the population. The two united nations of the Olöth Proper and Songares are dispersed over the whole country, and

among them are settled the nations which, since 1757, have been sent there by the court of Peking, the Tshagar Mongols, the Mandshoos, and the Chinese themselves. The Mandshoos and Chinese are engaged in agriculture, commerce, trade, or employed by government. The Tshagars are soldiers and agriculturists, and chiefly live in the military colonies. The majority of the other tribes live on the produce of their herds, but many of them have begun to apply themselves to agriculture, when the soil and other circumstances concur to render cultivation profitable.

Since the country has become subject to China, it has been divided into three districts, east, west, and north. The chief towns are as follows:—Barkoul, a fortified town; Oorum-tsi, a populous manufacturing town; Kuldsha, a large trading town with 50,000 inhabitants; Kashmirhuré, a newly-built town with 15,000 inhabitants. Tarbagatai, a fortified trading town, with 5000 inhabitants.

Since the country has been occupied by the Chinese, a considerable commerce has been established, and it is still increasing. The town of Kuldsha may be considered as the centre of this commerce. The most active branches seem to be the trade with China Proper, and with the town of Aksoo in Chinese Turkistan. The principal imports from China are the numerous articles manufactured in that country, which are consumed by the Chinese and Mandshoo families established in Songaria. The Russians do not send manufactures into Songaria, but only cattle and sheep. They are not permitted to enter the Chinese Empire in these places as Russians, but only as the subjects of some khan of the Khirghis Cossacks. It is therefore not an open trade, but a kind of smuggling.

The government of this province is on a military footing. The commander-in-chief of the troops is also invested with the civil authority. The governor is assisted by a council of five persons. The whole population of the country probably falls short of 2,000,000, and three-fourths of this number are wandering tribes, who are very lightly taxed.

SONNERA'TIA, a genus of plants of the natural family of *Myrtaceæ*. *S. acida* is the best known species. It has an acid eatable fruit. The tree is forty feet high, and is a native of New Guinea and the Moluccas, as well as of the Malabar coast and of the delta of the Ganges. *S. alba* is another species found in the Moluccas, and *S. apetala* is a native of Ava, near Rangoon, as well as in moist situations along the Birmese coast.

SONNET (Italian, *Sonata, Sonetto*), a form of poetry much used by the Italian and Spanish poets, but more sparingly practised in English. The sonnet properly consists of two quatrains and two tercets, or fourteen lines. The facility of rhyming in the Italian and Spanish languages enables their poets to express every feeling or fancy in the sonnet; but in English it is more difficult, and the Italian model is seldom strictly adhered to.

SONNINI DE MANONCOURT, CHARLES NICOLAS SIGISBERT, was born at Lunéville, Feb. 1 1751. He was educated at the Jesuit university of Pont-à-Housson, and at an early age became acquainted with Buffon and Nollet, who encouraged his taste for natural history. Having a wish to travel, he obtained a commission in the marine engineer service, and in 1772 was sent to Cayenne. While there, he succeeded, at great personal risk, in making a passage by water from Cayenne to the mountain La Gabrielle. He was, in consequence of this enterprise, promoted to the rank of lieutenant on his return to France. In 1775, after a visit to the western coast of Africa, he resumed his post as an engineer at Cayenne, and spent two years in researches in natural history. Returning to France, he passed the winter of 1776 with Buffon, assisting him in his labours, till he joined the African expedition of Baron de Tott, in 1777. After remaining some time in Egypt, and exploring the country, he travelled in Greece, the Archipelago, and Asia Minor. He returned to France in 1780, and at the beginning of the Revolution was appointed one of the administrators of the department of Meurthe; but he was deprived of this office by St. Just on account of his noble birth. He was afterwards placed at the head of the College of Vienne, in the department of Isère, but soon resigned the situation. In 1810 he went to Moldavia, and there caught a fever, from which he never recovered. He died at Paris, May 29, 1812. His principal works are, 'Voyage dans la Haute et Basse Egypt,' Paris, 8vo., 1799; 'Voyage en Grèce et en Turquie,' Paris, 8vo., 1801.

SOODAN, or BELE'D EL SU'DAN ('the Country of the Blacks'), is a term applied by the Arabs to designate the interior of Africa; but, according to the geographical position of the country in which it is used, this term indicates different portions of that continent. The inhabitants of Egypt apply it to the countries south of the second cataract of the Nile (22° N. lat.), and Mehemet Ali formed a province of all the countries in these parts which he subjected to his sway, under the name of Beled el Súdan. [SENNAAR.] The Arabs who trade to or are settled in Bornou, which is about 400 miles west of the Egyptian province, call 'Soodan' the countries which are still farther west, towards the middle course of the Quorra. The geographers of Europe have given it a more comprehensive application, and they designate all the countries along the southern edge of the Sahara from Senegambia and Sierra Leone on the west, to Dar Fur on the east, by the term Soodan. Thus Soodan extends from 10° W. long. to 25° E. long., and is 2400 miles in length. Its average width may be about 350 miles, and its area about 880,000 square miles.

Nearly up to the end of the last century this country was only known by the descriptions of the Arabian geographers and of Leo Africanus. At that time (1790) the first European traveller, Houghton, entered Soodan from the west; but he was killed in 1791. Mungo Park however succeeded in traversing the north-western portion of Soodan in 1796 and 1797, and collected very valuable information. The expedition under Denham and Clapperton (1822–24) made us ac-

quainted with a large portion of Central Soodan (between 6° and 17° E. long.), to which Clapperton, by his second journey (1826), added the south and south-west countries of Central Soodan; and Richard Lander, the vale of the river Quorra (1830). Caillié succeeded in traversing a large portion of South-Western Soodan in 1828.

Western Soodan comprehends the country west of the course of the Quorra, from Timbuctoo to its entrance into the delta at Abbazaca. The elevated tract which divides Soodan from Sierra Leone and Senegambia, and along the base of which the Joliba runs in a north-western direction as far north as Yamina, appears to be rather a huge swell of the country overtopped by rocky masses, than a mountain-range. The southern border of Western Soodan is formed by the Kong Mountains. The country extending from the northern base of the Kong Mountains to the edge of the Sahara may be considered as a plain. The soil of this extensive tract is chiefly gray sand, alternating in some places with red sand. In the vicinity of the watercourses it is subject to inundations for more than six months of the year. The more distant parts have the advantage of abundant rains, and are so far fertilised by them that no considerable part of the country can be called a useless waste. The most common objects of cultivation are maize, millet, rice, tobacco, yams, onions, cotton, French beans, water-melons, and calabashes. Near the base of the mountains a kind of long pepper and pimento is grown. In the same districts the colat or gora nuts are collected, which constitute an important article of commerce all over Western Soodan, and are carried from the Kong Mountains to Timbuctoo, and even to Tripoli, a distance of respectively 500 and 2000 miles. There are horses, asses, cattle, sheep, goats, and abundance of poultry. The country between 10° 30′ and the southern banks of the Joliba River is still more level, but less fertile. Several tracts which are a little depressed below the general surface are swamps during the greatest part of the year, whilst others are always in this state. The first are either used as pasture-grounds, or rice is cultivated on them, as well as on the borders of the others, and along the alluvial banks of the rivers. The part of Western Soodan which is north of the Joliba and the marshes contiguous to the river, is tolerably fertile to a considerable distance from its banks. A great part of Western Soodan, lying on both sides of the meridian of Greenwich, and extending along the banks of the Joliba or Quorra from Timbuctoo to Yaouri, has never been visited by Europeans.

Central Soodan comprehends that portion which extends from the river Quorra, where it flows southward, as far east as Lake Tchad and the river Shary, which falls into the lake, or from 5° to 16° E. long. It may be divided into two regions, a hilly region and an alluvial plain. The first occupies the country west of 11° E. long., and the plain occupies the remainder.

The hilly region extends to the very border of the Sahara, which in these parts occurs between 14° and 15° N. lat. The surface is extremely diversified. The highest hills which have been seen are not much more than 700 feet above their base, and the general level of the country seems to be about 1000 or 1200 feet above the sea. A great part of this region extends in level plains, which are chiefly converted into large swamps or temporary lakes during the rainy season, but this circumstance is favourable to fertility. There is however a large tract in which the swamps exist all the year round. This tract is situated north of 13° N. lat., and between 6° and 8° E. long., east of the town of Sockatoo, and is known by the name of the Gondami Swamps. Nearly all the rivers and watercourses of this region are very rapid and deep during the rainy season; but in the dry season only pools, sometimes single, sometimes in rows, occupy the lowest part of their bed. The soil retains moisture all the year round. Its quality of retaining moisture for a long time, even under a burning sun, renders this region the most fertile tract of Africa north of the equator, and is populous, in spite of the continual wars between its sovereigns, and its being situated in the centre of Africa, and being nearly secluded from commercial intercourse with other parts of the world. In some parts the villages are very numerous, and the towns are of considerable extent and contain a great population. The vegetable produce includes both tropical and European kinds. The domestic animals are goats, sheep, asses, horses, and cattle. Wild animals are numerous.

The Plain of Central Soodan extends from 10° E. long. to Lake Tchad and the river Shary, and from 14° to 10° 30′ N. lat., where it lies contiguous to a hilly country. The greatest part if not the whole of this plain is alluvial. It is very fertile, but not easily cultivated, as a large part of it is converted into lakes during the rains, which give rise to a rank vegetation, and thus create great obstacles to the clearing of the ground. The southern districts however are in general rather populous, and a considerable portion of them is cleared and cultivated. The climate of this region is hotter than that of the neighbouring hilly districts, but the daily range of the thermometer is much less. The principal objects of cultivation are gussup, which is a kind of millet, Indian corn, cotton, and indigo; the two last grow wild near Lake Tchad and the overflowed grounds. Sheep, goats, cows, and oxen are numerous.

The largest river is the Quorra, which in the upper part of its course is called Joliba. [NIGER.] It has numerous affluents. The other rivers of Soodan, of which the largest are the Yeou and the Shary, fall into Lake Tchad. This lake is of great size, and its length is stated to be five days' sail. Its eastern and north-eastern shores have never been visited by a European traveller. It is nearly surrounded by a low flat country, which for several miles from its banks is overflowed during six months of the year, and the other six months is mostly a swamp.

Eastern Soodan extends from 17° to 25° E. long. Europeans are almost entirely without authentic information respecting it.

Inhabitants.—The population is composed of aborigines and foreigners. The aborigines belong to the negro race. The negroes are almost ex-

clusively the inhabitants of the mountain region of Kong, but in the plain north of that range they live intermixed with Mandingoes and Foulahs. In the hilly region of Central Soodan the negroes constitute the bulk of the population, but they are governed by Fellátahs, and in the eastern plain they are intermixed with Arabian tribes, which have here obtained the ascendancy which the Fellátahs have acquired in the hilly region. These negroes have attained a certain degree of civilisation, and manufacture most of the articles which they require. The foreigners settled in Soodan are Mandingoes, Fellátahs, and Arabian tribes. The Mandingoes are only met with in the plain north of the Kong Mountains, where they have settled as merchants. The Fellátahs are the same nation which in Senegambia is known by the name of Foulahs, and they speak the same language. The Arabs settled in Soodan are only found in the neighbourhood of Lake Tchad, where they lead a wandering life, living on the produce of their cattle.

Political Geography and Towns.—Soodan contains many large and small states, and there occur also extensive tracts, in which the inhabitants live in a peaceful state of society, without having entered into a political union. We shall notice these political divisions in the order of the natural regions.

I. The *Mountain Region* of Western Soodan, or that of the *Kong Mountains*, comprehends two extensive countries, Yarriba and Borgou. The first occupies the southern portion, and extends to a short distance from the shores of the Bight of Benin. Yarriba is bounded by Borgou, Ashantee, Dahomey, and other states. It contains many considerable towns. The present capital is Eyeo, or Katunga, situated about 20 miles from the river Quorra. It is enclosed by walls built of clay, about 20 feet high, and surrounded by a dry ditch. They are about 15 miles in circumference, of an oval shape. The king's houses and those of his women occupy about a square mile: they are built of clay and have thatched roofs. A considerable part of the space enclosed by the walls is laid out in gardens or cultivated, and the population is about 20,000. The second town of the kingdom is Bohou, which was the capital about sixty years ago. It has an immense triple wall, which is rather more than 20 miles in circuit, and is built on the slope of a very gentle and fertile hill, in an exceedingly well-cultivated country. Many other towns are said to contain from 10,000 to 20,000 inhabitants. *Borgou*, which lies to the north of Yarriba, consists, so far as we know, of ten states, governed by independent kings, and loosely connected with one another. The names only of the states of Niki, Wawa, Kiáma, and Boussa are known. The capitals have the names of the respective countries. The largest among them is Kiáma, which is said to contain 30,000 inhabitants. Two caravan roads traverse this region.

II. The southern part of the *Plain of Western Soodan* presents a remarkable instance of people living in society and having attained a certain degree of civilisation without entering into a closer political union. Excepting a few small states, each town and village, according to Caillié, is independent of the neighbouring towns and villages, and what renders this circumstance more remarkable, each place is inhabited by a mixture of Mandingoes, who are Mohammedans, and of Bambarras, most of whom are pagans. Still they live peaceably together, and the elders of each nation decide the differences arising among the people belonging to their nation. On the banks of the Joliba several kingdoms occur, which contain a considerable number of large towns, but they have been little visited by Europeans. [BAMBARRA; TIMBUCTOO.]

III. The greater part of the hilly region of Central Soodan constituted at the beginning of the present century an integral part of the kingdom of Houssa; but it is now occupied by a number of small independent states, of which little more is known than the names. Several large towns are here met with. Yaouri, the capital of the state of Yaouri, is a place of great extent, and very populous. The wall is of clay, but high, and may be 20 miles in circuit. The space enclosed is not laid out in streets, but covered with clusters of huts, between which are cultivated tracts. In this place very neat saddles, country cloth, and gunpowder are manufactured. In the state of Nyfi is the town of Rabba, built on the banks of the Quorra. It is the emporium of all the surrounding countries to a great distance, and several articles are brought to this place from Tripoli on the Mediterranean. It contains a population exceeding 40,000, and has rather extensive manufactures of saddles and bridles, made of red and yellow leather, cloth, shoes, boots, and sandals. Kano, the capital of the state of the same name, is one of the most commercial towns of Central Africa. It may contain from 30,000 to 40,000 resident inhabitants, of whom more than one-half are slaves. During the dry months this place is resorted to by numerous travellers from all parts of Africa, from the Mediterranean and the Mountains of the Moon, and from Sennaar and Ashantee. The city is of an irregular oval shape, about 15 miles in circumference, and surrounded by a clay wall thirty feet high, with a dry ditch in the inside, and another on the outside. The houses are built of clay, and are mostly of a square form, in the Moorish fashion. They have generally two floors. Clapperton observes that the commercial intercourse is regulated with the greatest fairness, and the regulations are strictly and impartially enforced. Kano is not only a commercial, but also a manufacturing town; and the division of labour is carried to a considerable extent. Cotton, before it is fit to be consumed, passes through five or six hands. Sockatoo, the capital of Houssa, is considered by Clapperton to be the most populous town in the interior of Africa; but it is less commercial than some others.

IV. Nearly the whole of the *alluvial plain of Central Soodan* constitutes the kingdom of Bornou, or may be considered as an appendage of it, [BORNOU.] South of Bornou is the kingdom of Mandara. The inhabitants are exclusively ne-

groes, and are governed by a sovereign of their own race, who is independent both of the sheik of Bornou and the Fellátahs, who are in possession of the more elevated and mountainous country which lies farther south.

SOOFFEE DYNASTY. [PERSIA—*History.*]

SOOLIMA'S, a people of Western Africa, who take their name from, or, it may be, give their name to, their proper country of Soolimana. This country is situated among the sources of the rivers which enters the sea at and immediately to the north of Sierra Leone. This territory extends between 9° 20′ and 10° 28′ W. long., and mostly south of the 10th parallel of N. lat., being about 60 miles in breadth from north to south, and reaching from the present site of Falaba to the left bank of the Joliba or Niger. This is the native country of the Soolimas; but they now chiefly occupy a strip of land in the adjoining Kooranko territory, which is bounded on the south by the river Rokelle, on the north by Foota Jallon, on the west by Limba and Tamisso, and on the east by Kooranko Proper and Soolimana, which latter is now used only as a temporary residence. [SIERRA LEONE.]

SOOLOO-ARCHIPELAGO consists of a considerable number of islands, situated in the Indian Ocean, between the Philippines on the north-east and the island of Borneo on the south-west. They consist of two chains of islands, which with Borneo and the Philippines nearly enclose the Sooloo Sea. The southern chain of islands, which is properly called the Sooloo Islands, begins near 119° 30′ E. long., and 5° N. lat., and extends E.N.E. to 122° 30′ E. long. and 6° 50′ N. lat. The northern chain, which is called the Palawan Islands, begins on the south near 7° N. lat. and 116° 30′ E. long., and extends to 12° 20′ N. lat. and 120° 30′ E. long.

The larger islands of the chain are of moderate height, but the mountains on the island of Palawan attain a considerable elevation. Some of them are covered to the very summits with lofty trees, and others with rich pasturage. None of them are volcanic. The wet season occurs from May to September, during the prevalence of the south-western monsoon, and the dry season lasts from October to April. The soil is generally rich, and the crops are abundant, but not sufficient for the consumption. Rice constitutes one of the chief articles of importation. Indigo equal to that of Manilla is manufactured to some extent, but consumed in Sooloo. Very good cotton is grown in various parts, but not exported; tobacco also is grown. Turmeric and ginger grow to perfection. The woods supply fine timber of various kinds. The islands are well stocked with useful animals.

The Sooloo chain consists of three groups; those of Basilan on the east, Sooloo in the middle, and Tawi-Tawi on the west. The first-mentioned group is composed of the large island of Basilan and several smaller ones. Basilan is about 45 miles long, and the average width may be 12 miles. It is very fertile, and sends much rice to Sooloo. It exports, besides edible birds'-nests, mother-of-pearl shell, some tortoise-shell, and a few pearls; cowries are abundant. The principal ports are Maloza on the south-west side and Gubawang on the north-east coast.

The Sooloo group consists of the larger island of that name, and several small islands. Sooloo is about 40 miles long and 10 wide on an average. It is very populous. There are many small towns on the coast, the chief of which are Sooloo, Bokol, and Parang. The larger of the other islands belonging to this group are Pargutaran, Tapul, and Sibasi, lying north-west and west of Sooloo.

Tawi-Tawi is about 40 miles long and 12 wide. In the centre are some hills of considerable elevation, and two lakes of some extent. The island is thinly inhabited. The principal town is Dungon, on the banks of the lake of the same name. The chain of small islands which extends along the southern coast of Tawi-Tawi consists of low islands, with numerous shoals between them.

Between the north-eastern extremity of Borneo and the large island of Palawan are several smaller islands, and the three islands of Banquey, Balambangan, and Balabac, which are of some extent. They are thinly inhabited, and overrun with jungle and timber-trees. Palawan is more than 275 miles long, and on an average 32 miles wide. The northern portion of the island is subject to the Spaniards, and called Paragua. The low country south of 10° 20′ N. lat. is tolerably well peopled, and subject to the sultan of Sooloo, but the hilly and mountainous region is in possession of the aboriginal inhabitants, who resemble the Papuas, and are continually at war with the inhabitants of the plains.

The government of Sooloo resembles that which existed in the last century in Poland, and in the beginning of this century in the Mahratta dominions. Each chief or nobleman is sovereign in the country which belongs to him, and his authority depends on the number of his followers, or rather slaves, who are his soldiers.

The Sooloos belong to the Malay race. They have made considerable progress in civilisation in the last two centuries. The people are Mohammedans, but they know little of the tenets of their faith. The Chinese who are settled in these islands are for the most part engaged in traffic. The manufacturing industry of the inhabitants is very limited; but the position of the island of Sooloo is very favourable for commerce, being situated between the Moluccas, Celebes, Borneo, the coasts of Cochin-China, China, and the Philippines, and the trade would be very considerable if it were not continually interrupted by pirates.

SOOT is that portion of fuel which escapes combustion, and which is mechanically carried up and deposited in chimneys. The soot of coal contains sulphate and hydrochlorate of ammonia, a brown bitter extract, and an empyreumatic oil; but its great basis is charcoal in a state in which it is capable of being rendered soluble by the action of oxygen and moisture, and hence, combined with the action of the ammoniacal salts, it is used as a manure, and acts very powerfully as such. The soot of wood contains a greater variety of substances than that of coal, but much less both of carbonaceous matter and of ammoniacal salts.

SOPHISM (Σόφισμα). A sophism is the use

of some word in a different sense in the premises from that in the conclusion, and this is the definition of Aristotle ('Top.,' viii. 11.): 'When the discourse is a demonstration of anything, if it contains anything which has no relation to the conclusion, there will be no syllogism; and if there appears to be one, it will be a sophism, and not a demonstration.'

This confusion of words and ideas is the origin of all errors and sophisms; but though errors and sophisms are logically constituted alike, yet the instinctive sense of mankind marks the difference between incomplete views (error) and wilful perversion (sophism). In all cases a sophism is supposed to be recognised as such by the sophist. It is an endeavour on his part to 'make the worse appear the better reason.' It is the consciousness then of the sophist which distinguishes and renders odious his error as a sophism.

SOPHIST (*Σοφιστὴς*). 'It is well known,' says Dr. Wiggers, 'that the word *σοφιστὴς* at first had an honourable meaning, and was synonymous with *σοφὸς*, a sage, a scholar in its widest sense, for even artists were comprehended in it. Protágoras was the first who adopted the name of *σοφιστὴς*, to distinguish more decidedly one who makes others wise, especially one who taught eloquence, the art of governing, politics, or, in short, any kind of practical knowledge. From that time the word sophist acquired that odious meaning which it retains at the present day. Afterwards, in the time of the Roman emperors, the name of sophist again became an honourable appellation, and was applied to the rhetoricians.' ('Life of Socrates,' p. xiii., trans.)

The Sophists, of whom Socrates was the great opponent, were a class of men who went about Greece discoursing and debating, lecturing, and educating the sons of rich and noble families. The cause of their success lay in the nature and habits of the Greek people, who were so much addicted to talk and so little to study—who were so passionately fond of and so easily led by rhetoric. The period at which the Sophists flourished was one of obsolete creeds. Religion was attacked by open scepticism; the whole sect of the Eleátæ, with the exception of Empédocles, appear to have handled the history of the gods with arbitrary and allegorising boldness. Everything human and divine had lost its earnest nature, and came to be regarded as an art—an exercise of ingenuity. The art of the Sophists was oratory. Assuming that there was no right or wrong in the nature of things, but that the sole measure of right and wrong was the existing morality, or the existing law, it was their boast that they could make the worse appear the better cause. Their doctrines closely resemble those of the Sceptics, since they equally denied the possibility of truth, and even interdicted inquiry into it; but the distinction between these sects consists in the Sophists' not masking their arrogance under doubt, but boldly and distinctly averring that there was no truth at all, and seeking to communicate this wisdom to others, to save them the trouble of investigation.

The Sophists probably contributed to the improvement of the Greek language by the labour which they bestowed upon the distinction of terms, and by their attempts to reduce persuasion to the form of an art. Though many or most of them may have had no settled moral principles, and no very exact philosophical conceptions, it is somewhat difficult to imagine that there was a considerable number of teachers whose precepts were intended to be subservient to fallacy and deception. It is much more likely that many of them merely formed a very extravagant idea of their own acquirements and of the rhetorical art which they professed, and that they found persons ready to listen to their pretensions.

SOPHOCLES, son of Sophilus, was born in the Attic demus of Colónus, in B.C. 495, fifteen years before the battle of Salamis, when Æschylus was thirty years old. At the age of fifteen, when the Greeks had defeated the Persians in the battle of Salamis (480 B.C.), Sophocles, on account of his beauty, was selected by those who had the management of the solemnities which followed the victory, as leader of the chorus which danced around the trophies in Salamis and sang the hymn of victory. The first time that Sophocles produced a tragedy on the Attic stage was in the year B.C. 468. Æschylus was at this time the great dramatist of Athens, but his young rival, who contended with him for the prize, gained the victory.

Sophocles was actively employed in the exercise of his art from B.C. 468 to B.C. 440, when he brought out the 'Antigone,' his thirty-second drama; and he gained the prize. The Athenians appointed him one of the commanders to conduct the war against the aristocrats of Samos, who, after being expelled from the island by the Athenians, had returned from Anæa in Caria, and endeavoured to induce the Samians to revolt against Athens. In this campaign Sophocles was the colleague of Pericles; and he is said to have become acquainted with Herodotus in Samos. Whether Sophocles, after this expedition, which ended in 439 B.C., took any further part in public affairs, is not certain. His life seems to have passed in the glorious career of a successful dramatist. His first wife was Nicóstrate of Athens, by whom he had a son, Iophon; his second wife was Theóris of Sicyon, by whom he had a son called Ariston. He died in B.C. 406.

Aristophanes of Byzantium attributed to Sophocles 113 genuine dramas, which number includes his satyric dramas. At the age of forty-five he had written 32 dramas, so that more than two-thirds of his works were composed during the latter half of his life. The 'Œdipus in Colonus,' his last production, was written a short time before his death, but was not brought out till the year B.C. 401. Of all his plays there only remain seven; of others we only possess some fragments, and sometimes no more than the titles. The earliest of the extant pieces is the 'Antigone,' and the probable chronological order in which the others followed is this: 'Electra,' 'Trachiniæ,' 'King Œdipus,' 'Ajax,' 'Philoctetes' (first acted in B.C. 409), and the 'Œdipus in Colonus.'

The ancients considered Sophocles as the most perfect of all dramatic poets, and their admiration

was well founded. Sophocles abandoned the pomp, grandiloquence, and harshness of Æschylus, for which he substituted the noble simplicity and tenderness which the ancients admired. All his characters are men in the true sense of the word, beings with whom we can sympathise. Each drama of Sophocles turns upon one great action, the 'Antigone' perhaps excepted; and one idea, which is the leading idea of the drama, is perfectly developed in one play; while with Æschylus the three plays of a trilogy are like so many acts of one drama. Although therefore Sophocles may usually have brought out three tragedies at once, each of them was complete in itself. The lyric part, or the chorus, in Sophocles has no longer that prominent place which it has in Æschylus; it no longer expresses the feelings supposed to be called forth in the audience; but the tragic development of the characters of the drama, or, in other words, the action, is the prominent part of the drama. As the action was thus extended, Sophocles introduced a third actor, or the tritagonistes, so that now three actors might appear upon the stage at once, whereas before his time there had not been more than two at a time, which rendered the action, as well as the dialogue, monotonous.

The works of Sophocles were first printed by Aldus, Venice, 1502, 8vo. The best of the subsequent editions are those of H. Stephens, Paris, 1568, 4to., and that of Brunck, Strassburg, 1786. The text of Brunck has served as the basis for all subsequent editions. One of the most useful editions of Sophocles for students is that by E. Wunder, Gotha and Erfurt, 1831-1841. The editions of single plays and dissertations upon them are very numerous. There are English translations of Sophocles by Franklin, Potter, and Dale.

SOPHORA, a genus of plants of the natural family of *Leguminosæ*, said to be so named from an Arabic name (*Sophera*) of one of the species. These are ornamental shrubs and trees, found in central and tropical Asia, also in the warm parts of North America and the equinoctial and subtropical parts of South America. The species best known in England are *S. japonica* and *S. Chinensis*, which, being from the northern latitudes of the countries from which they are named, are hardy enough to withstand the climate of England.

SO'PHRON, son of Agáthocles, a native of Syracuse, was born about the year B.C. 420. He is supposed to have been the inventor of a peculiar kind of poetry called Mimes. He wrote his works in the vulgar dialect of the Doric Greek as spoken in Sicily, and in a kind of rhythmical prose. A few fragments of the mimes of Sophron remain.

The fragments are collected by C. J. Blomfield, in the 'Classical Journal,' vol. iv., p. 380, &c., to which there is a supplement by the same scholar in the 'Museum Criticum,' No. VII.

SOPORI'FICS. [Anodynes; Narcotics.]

SOPRA'NO. [Voice.]

SORA. [Lavoro, Terra di.]

SORBONNE, a celebrated college at Paris. The founder was Robert de Sorbonne, an ecclesiastic (born A.D. 1201) at the village of Sorbon, in the territory of Rethel, now in the department of Ardennes, of poor parents. His talents and acquirements introduced him to the notice of Louis IX. (St. Louis), king of France, who retained him at his court as his confessor and chaplain, and showed him great favour. In 1251 he was made a canon of Cambray, and, mindful of the difficulties which he had experienced in early life, he formed the plan of an institution for the assistance of poor students. His intention was to establish a society of secular priests, for whom a maintenance in common should be provided, and who should devote themselves gratuitously to the work of instruction in theology. A society on this plan was founded by him with the aid of his friends, all of them ecclesiastics, A.D. 1252 or 1253; and was encouraged by the patronage of the king. Robert de Sorbonne was the first head of the establishment; and it was not until after eighteen years' official experience that he settled the constitution and regulations of the establishment, which were not in any respect changed until the suppression of the college at the Revolution. Robert established another college, for the study of the humanities and philosophy, that of Calvi, sometimes called 'the Little Sorbonne,' near his principal foundation, to which it seems to have been preparatory. This minor establishment was destroyed in order to erect the church when Richelieu rebuilt the college premises. In A.D. 1258 Robert was made canon of the cathedral at Paris, and died in 1274, bequeathing all his property to the college which he had founded.

The members of the college were either doctors or bachelors of theology, who taught theology gratuitously to poor students. Ladvocat, in his 'Dictionnaire Historique,' and Duvernet, 'Histoire de la Sorbonne,' have given an account of the constitution of the college. The Sorbonne was one of the four constituent parts of the faculty of theology in the University of Paris; and its high reputation caused it to be often appealed to for the judgment of its members on questions of theology and morals. The first printing presses of Paris were established in the Sorbonne.

SORBUS, the Linnæan name of a genus of plants, comprising the Mountain-Ash, Rowan-Tree, and Service-Tree. It is now made a subgenus of *Pyrus*.

SORECIDÆ. [Soricidæ.]

SORGHUM, a genus of grasses, said to be named from the Oriental name of one of the species, of which *sorgo* is the Italian name. The species form tall grasses with succulent stems, and are found in the tropical parts of Asia, whence they have spread to the warm parts of Europe. *Sorghum vulgare* is the largest of the small cereal grains, and may be considered the representative of the Indian Corn (*Zea Mays*) in America, where it is usually called Guinea Corn, and in some works Great Millet or Indian Millet. Different kinds are cultivated in India, where they are of much importance, since many of the inhabitants live as much upon these small or dry grains as upon rice. This grain is the *Durra* of some Arab tribes, and is extensively cultivated through-

out Asia, and appears to be the Tall Corn of the Chinese. It has been introduced into the south of Europe, where it is chiefly employed for feeding cattle and poultry, but it is also made into cakes.

SORIA. [CASTILLA-LA-VIEJA.]

SORI'CIDÆ (sometimes, but erroneously, written SORECIDÆ), the family of the *Shrews*, or Shrew-Mice, belonging to the INSECTIVORA. Cuvier, it may be observed, regards the *Insectivora* as a family of the *Carnassiers* (carnivorous mammalia), but by most writers of the present day it is considered as forming an order of itself.

Under the family *Soricidæ* some naturalists arrange the Shrews (*Sorex*), the Desmans (*Mygale*), the *Scalops*, the *Chrysochloris*, the Moles (*Talpa*), the Tenrecs (*Centenes*), and the Condylures (*Condylura*).

Under the family *Soricidæ* we may range the *Solenodon* [SOLENODON], the Shrews (*Sorex* and *Mygale*), and *Macroscelides*.

The Shrews (*Sorex*) are animals mostly of minute size, and covered with hair. Along each side under the ordinary fur is found a little line of stiff and close-set bristles, whence at certain seasons exudes an odorous humour, the secretion of a particular gland. The two middle incisors above are hooked, and notched at their base; the lower are directed forward, and elongated; five little teeth on each side follow the former, and two only the latter; there are besides three bristling molars and a tuberculous molar above. Snout attenuated. Tail long.

These animals live in holes, which they burrow in the earth, and which they seldom leave except towards evening. They feed upon insects, worms, &c. Their geographical distribution in Europe and Asia is very extensive.

Three British species, viz. the Common Shrew (*Sorex araneus*), the Water Shrew (*S. fodiens*), and the Oared Shrew (*S. remifer*), are known, and are well described by Mr. Bell in his 'British Quadrupeds.'

The Common Shrew is the *Musaraigne* of the French; *Toporango* of the Italians; *Murganho* of the Spanish; *Spitzmaus* and *Zismaus* of the Germans.

Common Shrew (*Sorex araneus*).

Genus *Mygale* (*Myogalea*, Fischer). Great lower incisors having between them two very small teeth. Muzzle in a very small and very moveable proboscis. Ears short. Five unguiculated toes on each foot united by a membrane. Tail long, scaly, compressed laterally.

Incisors, $\frac{2}{8}$; canines, 0; molars, $\frac{10-10}{7-7} = 44$.

Example.—*Mygale moschata*, *Castor moschatus*, Linnæus.

Description.—Tail shorter than the body, scaly, nearly naked, contracted at its base, cylindrical, and convex in its middle, very much compressed vertically at its extremity; fur brown or dusky above, whitish ash below: total length, including the tail, about 15 inches, of which the tail measures eight.

This appears to be the *Dæsman* of the 'Fauna Suecica;' *Le Desman* of the French; the *Biesamratze* of the Germans; and the *Muscovy Rat*, or *Musk Rat*, of the British.

Locality.—The river Wolga, and the adjacent lakes from Novgorod to Saratov.

Habits, &c.—This species does not appear to have been seen on dry land; and indeed it is broadly asserted that it never goes there, but wanders from lake to lake in fortuitous floods only. It is often seen swimming or walking under the water, and coming for air to the surface, where, in clear weather, it is apt to sport. Stagnant waters shut in by high banks are its favourite localities, and in such places it makes burrows some twenty feet in length. Its principal food is alleged to consist of fish, leeches, and the larvæ of water-insects; but the fragments of roots have been found in its stomach. Its pace is slow; but it does not seem to be torpid in winter, at which season it is often taken in nets. The holes which it makes in cliffs and banks have the entrance far beneath the lowest level of the water, and the animal works upwards, never however reaching the surface, but only sufficiently high to secure itself from the highest rise of the river. Fish, as we have seen, forms part of its food, but the quadruped in its turn falls a victim to the Pikes and *Siluri*, whose flesh becomes so impregnated with the flavour of musk in consequence, as not to be eatable.

From the region about the tail a sort of musk, resembling the genuine sort, is expressed; and the skins are put into chests and wardrobes among clothes, for the purpose of preserving them from moths.

There is a species more than eight inches in length (*Mygale Pyrenaïca*) inhabiting Tarbes at the foot of the Pyrénées.

The genus *Scalops* we refer to the TALPIDÆ. For an account of the habits and manners of the *Scalops aquaticus* (the Brown Mole of Pennant, the Shrew-Mole of Godman, and the Mole of Lewis and Clarke), which inhabits the banks of the Columbia in considerable numbers, we must refer to Dr. Richardson's 'Fauna Boreali-Americana.' In its mode of life, no less than in its appearance, it closely resembles the mole.

Genus *Macroscelides*.—Muzzle narrow, ending anteriorly in a long and subcylindrical proboscis, having nostrils at its apex. Eyes moderate. Ears large and round. Body furry. Tail elongated, scaly, annulated, and furnished scantily with hairs.

Feet distinct, plantigrade, and five-toed; the claws falcular. Hind-legs shorter than the fore-feet.

Incisors, $\frac{2}{2}$; canines, $\frac{4-4}{4-4}$; molars, $\frac{5-5}{5-5}$ =40.

Example.—*Macroscelides typicus.*

Description.—Above brown, brightened by an intermixture of tawny; beneath whitish; extremities covered with a very short whitish hair; ears within, scantily furnished with some of a similar colour, without, nearly bare; tail thinly clothed with a stiff short black hair; whiskers near the base of the proboscis, each hair variegated black and white; claws short, black, compressed, and pointed. Length from nostrils to root of tail four inches and three-quarters; length of tail three inches and a quarter.

The colour of both sexes is nearly alike.

Locality, Habits, &c.—Inhabits the open country in the interior of South Africa, and is occasionally seen during the day about the roots of bushes or amongst brushwood, from which, upon being discovered, it instantly retreats to its subterraneous habitation. ('Zool. Journal.')

Dr. Smith, in his 'Illustrations of the Zoology of South Africa,' thus further describes the appearance and habits of *M. typicus* which he had first recorded in the 'Zoological Journal' under the name of *M. Typus*.

'It is found inhabiting open arid plains, particularly such as bear a thin coating of brushwood. It lives in burrows under ground, the passage to which is usually for some distance below the surface almost perpendicular; it vacates these during a great portion of the day, and is employed either in seeking its food or basking in the solar rays. To the latter it is very partial, and for the purposes of insuring the greatest amount of heat, it usually sits erect upon its hinder legs, and facing the direction from which the heat proceeds. When disturbed while occupied in either of the ways mentioned, it flies immediately to its subterranean retreat, and its progress is effected with such rapidity, that it is impossible to discover anything either of the form or the real nature of the animal as it advances. On this account I was familar with the general appearance it presents on such occasions long before I had any idea of its real character. It feeds upon insects. The discovery of this little animal in 1828, rendered the institution of a new group of *Insectivora* necessary. When its characters were indicated in 1829, *M. typicus* was only known. At present the number of described species are seven, six of which belong to Southern Africa and one to Algiers.'

SORREL. [Rumex.]

SORRENTO. [Naples, Province.]

SORUS, in Botany, a term applied to the collections of the sporangia or capsules which are found on the edges or the under surface of the fronds of ferns. The term sorus is sometimes applied to mere collections of spores or granules, as seen in many *Algæ*, of which *Delesseria alata* and *D. sinuosa* are examples.

SOSI'GENES, an Egyptian astronomer, who was brought to Rome by Julius Cæsar, to superintend the correction of the calendar.

SOSOS. [Saros.]

SOTHEBY, WILLIAM, was born in London, Nov. 9, 1757. He was educated at Harrow School till he was seventeen years of age, and then purchased a commission in the Tenth Dragoons, but immediately obtained leave of absence, and passed several months at the military academy at Angers. On leaving Angers he passed a winter and spring in Vienna and Berlin, and rejoined his regiment at the end of 1777, at Knaresborough. In 1780 he married, quitted the army, and settled near Southampton. In 1788 he made a tour through Wales with his brother Admiral Sotheby, of which he published a poetical narrative under the title of 'A Tour through North and South Wales.' In 1791 he removed to London, and soon after became a Fellow of the Royal Society, of the Antiquarian Society, and of the Dilettanti Society.

The language and literature of Germany had been for some time advancing in favour in England. Sotheby studied the language, and in 1798 published a translation of Wieland's 'Oberon,' which became popular. In 1799 he published a short poem on the battle of the Nile, and in 1800 a translation of the 'Georgics' of Virgil. In 1801 he addressed Sir George Beaumont in a 'Poetical Epistle on the Encouragement of the British School of Painting.' In 1802 he published 'Orestes,' a tragedy, on the model of the Greek drama, accompanied by a masque, entitled 'Huon de Bordeaux,' founded on the story of 'Oberon.' His next work, which appeared in 1807, was an epic poem, in blank verse, under the title of 'Saul.' In 1810 he produced 'Constance de Castille, a Metrical Poem, in Ten Cantos.' In 1814 he republished 'Orestes,' together with four other tragedies. When he was in his seventieth year he commenced a poetical translation of the 'Iliad,' which he completed in Sept. 1830. He immediately commenced the 'Odyssey,' which he finished in July, 1832. He died Dec. 30, 1833. Besides the works already mentioned, Sotheby published, in 1828, 'Italy, and other Poems,' fcap. 8vo., consisting chiefly of descriptions of Italian scenery, most of which were probably written during a tour through that country which he made in 1816-17, and a few other small compositions.

SOTHIAC PERIOD. The ancient Egyptian year consisted only of 365 days, without any intercalation; and was divided into 12 months of 30 days each, with 5 days added at the end. The Scholiast on Aratus informs us that the priests were sworn never to alter this year. Again, Diodorus Siculus says, that the Egyptians add five days and a quarter to the 360 days of their 12 months, which statement is generally supposed to refer to a more correct year which had been introduced among the people, while their religious festivals continued to be regulated by the old year. The propriety of this mode of reconciling the two authorities is made probable by the known existence of the Sothiac period (also called the Canicular year, Annus Magnus, &c., derived from Sothis, a name for the star Sirius), mentioned by Geminus, and also by Censorinus and Clement of Alexandria, from older writers. It is obvious

that 1461 years of 365 days each, make 1460 years of 365¼ days. This period of 1460 Julian years was the Sothiac Period.

The epoch of commencement of a Sothiac Period is not well determined, and only from comparatively modern writers. Censorinus asserts that the consulship of Ulpius and Pontianus (usually placed in A.D. 238) was in the hundredth year of such a period: accordingly B.C. 1322 was the beginning of the preceding period. Clement of Alexandria says that the period began 345 years after the migration of the Israelites from Egypt, a date which differs considerably from that of Censorinus, according to modern chronologers. The point is however of no importance, as no dates were ever recorded in written history by means of Sothiac Periods.

SOTO, DOMINGO, was born at Segovia, in 1494. His father was a gardener. Soto went to the University of Alcalá, and afterwards to Paris. On his return to Spain in 1519, he taught philosophy, first at Alcalá, and then at Salamanca; and in 1524 entered into the Dominican order. It was about this time that he published his treatise on the Dialectic and Physic of Aristotle, entitled 'Summulæ,' Salamanca, 1525, 4to. In 1545 the Emperor Charles V. sent him as his first theologian to the council of Trent, of which assembly he was one of the most active members. He died at Salamanca in 1560. Soto was the author of 'Commentaries on Aristotle's Categories,' and also of some other works.

SOTTERVILLE. [SEINE INFÉRIEURE.]

SOUBISE, BENJAMIN DE ROHAN, baron of Frontenai, and brother to the famous Duc de Rohan. [ROHAN.] He was born in 1589. He became an active partisan of the Huguenot party, and in 1615 he joined the army of the Prince de Condé, and, on the breaking out of the religious wars in 1621 his talents as a leader induced the assembly of Rochelle to give him the general command in Bretagne, Anjou, and Poitou. With his brother he defended St. Jean d'Angeli against Louis XIII. and his army; and it was not till after a month's hard fighting that the place surrendered, and Soubise vowed inviolable fidelity to Louis XIII. The inviolable fidelity however disappeared with the absence of danger, and accordingly we find him very soon after flying to Rochelle, there to form new intrigues. He soon after collected a few troops and seized Royan; and in the winter of 1622 made himself master of Bas-Poitou, together with the Isle of Ré, Perier, and Mons. This success drew 8000 men to his standard, with whom he seized Olonne. Louis again marched to meet him, and routed his army after a short conflict. Soubise escaped, and the king declared him a rebel, but by the edict of pacification published at Montpellier, Oct. 19, 1622, he was restored to his honours and estates.

But Soubise could not remain inactive. In 1625 he again seized the Isle of Ré, with three hundred soldiers and one hundred sailors. Encouraged by this success, he descended on Blavet in Bretagne, where the royal fleet was at that moment; and having captured the ships he attacked the fort, but was repulsed; and after a fruitless siege of three weeks, he set sail for the Isle of Ré with fifteen ships.

His daring had surprised every one; and the Huguenots now acknowledged him as their chief. The king, occupied with the Spanish war, offered him the command of a squadron of ten ships in an expedition to Genoa, as an honourable way of returning to his allegiance. Soubise refused the offer; and naming himself admiral of the Protestant church, persisted in the war. On Sept. 15, 1625, after a sharp conflict, he was beaten by the royal fleet near the Isle of Ré, and afterwards by the royal troops on the Isle, and saved himself by ignominious flight.

He then came to England. Charles I., interposing on behalf of the French Protestants, obtained for them a new edict of pacification, April 6, 1626. Soubise remained in England, and endeavoured to win over the Duke of Buckingham to support the Huguenots; and he succeeded. Louis having determined to besiege Rochelle, Soubise obtained two fleets from England for its defence; but the Rochellois refused to admit the English ships into their ports, or Soubise within their walls. Nothing daunted, he again returned to England; and, after pressing Charles for some time, had a third fleet granted, under the command of Buckingham. This fleet was at Plymouth, and ready to start; but Buckingham, having quarrelled with Soubise, annoyed him by all sorts of delays. On Sept. 2, 1628, Buckingham was stabbed by Felton.

The command of the fleet was then bestowed on the Earl of Lindsey; but Lindsey, when the fleet was before Rochelle, would not act in concert with Soubise, and in the meanwhile Rochelle capitulated. Soubise returned to England, where he ceased not to intrigue against his country. His restless career was terminated in 1641, when he died.

SOUBISE, CHARLES DE ROHAN, was born July 16, 1715. He served Louis XV. as aide-de-camp in all the campaigns of 1744 to 1748. His services were rewarded by the appointment of field-marshal in 1748, and in 1751 with the government of Flanders and Hainault. Being defeated by the Prussians at Rosbach, he returned to court, the object of a thousand malicious epigrams. But Louis remained firm in his attachment to him, and made him minister of state, with a pension of 50,000 livres.

In 1758 he commanded a new army, and defeated the Hessians, Hanoverians, and English, first at Sondershausen, July 13, and next at Sutzelberg, Oct. 10, by which he completed the conquest of the landgraviat of Hesse. On the death of Louis, Soubise alone of all the courtiers followed the funeral procession. He had resolved to retire from the court, but Louis XVI., touched with his fidelity, requested him to retain his place as minister, which he did. He died July 4, 1787.

SOUDAN. [SOUDAN.]

SOUFFLOT, JACQUES GERMAIN, was born at Irancy, near Auxerre, in 1713. He early evinced a taste for architecture, and, in order to pursue its study, visited Rome, where he was admitted as a pensionary at the French academy.

He commenced the practice of his profession at Lyon; and besides the Exchange (now converted into the Protestant church), and some other works of less importance, he executed one of the largest public edifices in that city, the Great Hospital, the façade of which is somewhat more than 1000 feet in extent. He was next invited to Paris, where he was admitted into the Royal Academy of Architecture; and shortly after he revisited Italy, and examined the antiquities of Pæstum in 1750. In 1754 he was again employed at Lyon to erect the Grand Théâtre, which has since been replaced by another structure.

It having been determined to rebuild the ancient and greatly decayed church of St. Geneviève, at Paris, several architects presented designs for the new edifice, among which those by Soufflot obtained the preference; and in 1757 the works commenced. Soufflot did not live to see his great work completed: he died Aug. 29, 1781. In the Revolution of 1789, the destination of the building was changed, and it was then called the Pantheon, by which name it is still generally spoken of. It is now restored to its original purpose, and the dome, &c., are decorated with paintings by Gros and others.

SOUILLAC. [Lot.]

SOULAMIA, a genus of plants belonging to the natural order *Polygaleæ*. *S. amara*, Bitter Soulamia, is a native of the Moluccas, and has white racemose flowers, the size of those of the vine.

SOULS, CURE OF. [Benefice.]

SOULTZ. [Rhin, Bas.]

SOUND. [Acoustics.]

SOUND. [Belt.]

SOUND-BOARD, or SOUNDING-BOARD, a board placed over a pulpit or other place occupied by a public speaker, to reflect the sound of his voice, and thereby render it more audible. Sounding-Boards are usually flat, and placed horizontally over the head of the speaker, but a different form and position, contrived by the Rev. J. Blackburn, of Attercliffe-cum-Darnell, near Sheffield, has been adopted in some cases with great advantage. In this arrangement the sounding-board is a concave parabola, which extends partly over and partly behind the speaker.

SOUNDINGS, in Hydrography, are properly the depths of water in rivers, harbours, along shores, and even in the open seas; but the term is also applied to the nature of the ground at the bottom of the water.

If the depth of the water is comparatively small, a man who is stationed for the purpose in the main or mizen chains, on the windward side, throws out a mass of lead, usually in the form of a frustum of a cone and weighing 8 or 9 lbs., which is attached to one end of a line between 20 and 30 fathoms in length. On this line are fixed, at intervals of two or three fathoms, pieces of leather or cloth of different colours; and the mark which is next above the surface of the water when the lead strikes the bottom affords an indication of the depth.

That which is called the deep-sea lead weighs from 25 to 30 lbs., and is attached to a line of great length, on which at intervals are knots indicating the depths. The bottom of the lead is covered with a coating of tallow for the purpose of ascertaining, by the sand, shells, or other matter which may adhere to it, the nature of the ground.

When soundings are to be taken in the survey of a coast, a harbour, or the mouth of a river, the surveying ship and its boats are disposed at convenient distances from each other (suppose from two to five miles); their distances with respect to each other and to remarkable objects on the shore being determined by the usual trigonometrical observations. The boats then row or sail along the directions of the lines joining each other, sounding as they proceed at equal intervals, suppose ten minutes, of time; and thus the outline of the shoal, reef, coast, or river, will be determined, as well as the depth of the water. All the soundings must be afterwards reduced to the depths below the surface of the sea at the level of low water.

In order that the rise and fall of the tide may be ascertained, the ship should remain in its position during twenty-four hours, and at certain intervals of time the depth of the water should be observed by the sounding lead, or by means of a graduated pole which is suffered to fall into the water, and is retained in a vertical position by means of a heavy weight at its lower extremity. An electro-magnetical apparatus has been invented by which the precise moment when the sounding lead strikes the bottom may be ascertained.

SOUSLIK, the name of certain marmots with cheek-pouches (*Spermophilus*, F. Cuv., *Arctomys*, Gmelin.).

The European and Asiatic *Souslik*, or *Zizel* (*Mus Citellus*, Linn.), has the face cinereous and a white line over each eye. The teeth are yellow, and the whiskers black and long. It is gray-brown above, undulated or spotted with white below.

There appear to be several varieties. One spotted (guttatus); one undulated (the Zizel); and a third of a yellowish uniform brown (*Yevrashka*, the Siberian Marmot). Length a foot: that of the tail to the end of the hairs four inches and a half.

Geographical Distribution.—Bohemia, Austria, Hungary; from the banks of the Wolga to India and Persia, through Siberia and Great Tartary to Kamtchatka; some of the intervening isles, such as Kadjak; and even the continent of America itself. (Pennant.)

Habits, &c.—This marmot or ground-squirrel (as these *Spermophili* have been termed from their more slender forms) burrows and provides for its winter food by laying up a magazine of corn and nuts. Some inhabit the fields, and their holes have a double entrance: others inhabit granaries, and these are said not to sleep in winter like the field sousliks, but to remain in motion during the cold season. They sit in multitudes near their holes, and only one inhabits each burrow. The females remain separate from the males except during the breeding season, which is in May, and produce from five to eight young ones: these they bring up in their burrows and cover with hay.

The sousliks are very quarrelsome among themselves, and bite very hard. They whistle like the common marmot. They are supposed to be very fond of salt, and have been taken in numbers on board the barges laden with that commodity at Solikamsky, which drop down into the Wolga below Casan. The sousliks are said to have an appetite for flesh, and to feed on the young of little birds and the lesser mice, as well as on corn, nuts, &c.

North America produces several species, for an account of which see Dr. Richardson's 'Fauna Boreali-Americana.'

SOUTH AUSTRALIA is a British colony, established on the southern shores of Australia. It extends from 132° to 141°.E. long. From the coast, which at its western borders occurs near 32° 30′, and at its eastern near 38° S. lat., its boundary line runs due north to 24° S. lat., which parallel constitutes its northern boundary. Within its boundary are contained two large bays: Spencer's Gulf, and the Gulf of St. Vincent, and the lower part of the course and basin of the River Murray. Kangaroo Island, which lies before the entrance of the Gulf of St. Vincent, is also annexed to it. The area of the colony, according to a rough estimate, is about 320,000 square miles.

The western portion of the territory, as far E. as Streaky Bay, is low, and a mere waste. E. of Streaky Bay, and as far as Coffin's Bay, there are some low hills covered with grass and bushes. Towards the southern extremity of the peninsula lying east of Coffin's Bay, the hills rise higher, and attain an elevation of between 600 and 800 feet; they consist of sandstone, and are covered with wood. The interior of the peninsula is low and barren, and interspersed with salt-lakes. Where the peninsula is connected with the main body of Australia, between Streaky Bay and the head of Spencer's Gulf, lies a mountainous tract, exhibiting a succession of lofty rugged ranges, one behind the other, running from east to west, but turning north-west at their western extremity. They are called Gawler's Range, and attain an elevation of about 2000 feet above the sea-level, but decrease as they advance farther east. The country situated on the western shores of Spencer's Bay is of a much better description. It contains Port Lincoln, the most extensive and the best harbour in the colony. It consists of three basins: Spalding Cove, Port Lincoln, and Boston Bay, in each of which there is not less than ten or twelve fathoms of water, with a bottom of muddy sand; they are capable of holding the navies of all Europe. The table-land behind Port Lincoln terminates at the head of Spencer's Gulf, where a rather narrow low tract separates it from Flinders' Range. This tract is quite level, and has a sandy soil almost without vegetation. Flinders' Range constitutes the western border of a mountainous tract of considerable extent. In the southern portion of this mountain-region several summits attain an elevation of between 2000 and 3000 feet. The highest appears to be Mount Brown, not far from the head of Spencer's Gulf.

The mountain-region terminates on the north near 29° 20′ S. lat. Its extremity is surrounded

by a level desert, which when first seen appears to be covered with water and studded with islands. The first explorers of this region considered it to be a lake, and called it Lake Torrens. But it was found that these appearances were deceptive, being caused solely by an extraordinary mirage. The river Broughton may be considered the southern boundary of the barren mountain-region just described. South of the Broughton a few high hills are found, as the Razorback (2900 feet above the sea), and the Lagoon Hill (2260 feet), but they soon sink much lower. The country between these hills and the shores of Spencer's Gulf presents open grassy downs, which are well adapted for sheep, and abundantly watered by ponds. With this part is connected Yorke's Peninsula, which separates Spencer's Gulf from the Gulf of St. Vincent. This peninsula is about a hundred miles long, with an average width of fifteen miles.

The best portion of the colony is the country lying on the east of the Gulf of St. Vincent. The interior of this tract is hilly, but the hills do not attain a great elevation; the highest, called Mount Lofty, is about 1200 feet above the sea-level. The hills come down to the sea on the Gulf of St. Vincent. On the western shore of the Gulf the capital of the colony, the town of Adelaide, is situated. It is built on the southern bank of the Torrens, a very shallow river which rises in the hills about six miles east of the town. The Creek is an inlet, branching off from the Gulf of St. Vincent about twelve miles to the north-west of Adelaide. As the water in the wells of Adelaide is brackish, that of the Torrens River is used for all purposes, and is even transported to Port Adelaide for the consumption of the people there, and for the vessels.

The Murray is the largest river in Australia, and its remotest tributaries rise in the mountains which are not far from the eastern shores of that continent. It enters South Australia near 34° S. lat., and flows for about eighty miles west, when it suddenly turns to the south, and runs in that direction to the sea; before entering into the sea it expands into a large lake called Lake Victoria, which is connected by a short channel with a smaller lake called Lake Albert. The flat shores of the Murray consist of very rich soil.

The interior of the country, which, south of the parallel of Lake Victoria, extends from the sea to 141° E. long., is a desert; its surface being formed by a succession of low ridges destitute of vegetation, with wide valleys between them, in which only shrubby bushes grow. At the sea-mouth of the Murray begins a narrow arm of the sea, which extends along the shores and parallel to them over an extent of more than a hundred miles. It is called Coorong, and is separated from the open sea by a narrow strip of land covered with sand-downs of moderate elevation. At the back of the Coorong is a succession of swamps. Near the sea-shore low narrow ranges of wooded hills alternate with grassy plains and a few swamps. In approaching the higher country plains occur, which are of considerable extent, and covered with luxuriant forests, consisting of trees of great size,

blackwood, gum, stringy bark, and mahogany. The soil of this region is of the richest description, being mostly a black brown loam.

Kangaroo Island, which lies before the entrance of the Gulf of St. Vincent, is about 80 miles long from east to west, and on an average about 20 miles wide, which gives an area of 1600 miles. On its north eastern shore is a safe harbour called Nepean Bay. On the shores of this bay is a salt lagoon, on the banks of which large masses of crystallised salt are found. It would seem that nearly the whole of the island is available for agriculture or pasturage.

During the rainy or cold season a great number of whales visit the coasts of the colony, and are chased by British, American, and French vessels. The native animals are the kangaroo and several smaller species of the same genus, and the dingo, or Australian dog. Birds are numerous, and distinguished by their beauty. The emu, parrokets, cockatoos, partridges, and quails, are common. There are several kinds of snakes and lizards. The colonists have imported horses from Tasmania and New South Wales, and ponies from the island of Timor in the Indian Archipelago; cattle and sheep from the Cape, Tasmania, and New South Wales; hogs from New Zealand.

The woods of South Australia contain many large trees, but the timber is not much valued; and this article is imported from New South Wales and New Zealand. All kinds of grain have been introduced, and grow well, and also vegetables; but English fruits do not succeed so well. Iron has been found in a few spots, and salt in many. The copper ores are very rich, and are wrought to great advantage. Gold has been met with in some spots.

The natives of South Australia, like those of New South Wales, belong to that race which is called Negro Australian; but it appears they have not yet attained an equal degree of civilisation with the native population of the eastern coast of Australia. Though it appears certain that all the natives of the southern and eastern coast of Australia speak the same language, a marked difference exists in the dialects spoken in different parts. Three such dialects are used within the territories of South Australia.

The settlement of Adelaide was founded in 1835; but six or nine months previously some families had settled on Nepean Bay, on Kangaroo Island, at a place called Kingscote. At first the emigration to this colony was very great: and in 1840 the number of the white population was estimated at 15,000. The emigration then slackened for a time, but has been since renewed. The emigrants in the four years 1844-5-6-7, amounted in number to 13,554. The population at the end of 1848 was estimated at 38,666.

The area of land enclosed for agricultural purposes amounted by the end of 1848 to 125,643 acres; and the area under cultivation 48,911. The land sold by the Crown amounted at the same time to about 500,000 acres; and 400,000 acres more were surveyed and ready for sale. The exports of the colony amounted in 1848 to 485,951*l.*, and the imports to 471,556*l.*: 2168 cwts. of tallow were exported in that year. There were 27 copper mines in the colony in 1847. In that year the copper ore exported amounted to 10,600 tons; the wool to 2,300,000 lbs.; the wheat to 10,000 qrs.; and the flour to 20,000 cwts. In the same year there were in the colony 45 Sunday schools, attended by 2500 children; and 81 day schools, attended by 2900 children; besides a school at Adelaide for children of the natives. There were 21 churches and chapels belonging to the establishment, 4 to the Church of Scotland, 3 to the Church of Rome, 49 to the various bodies of Dissenters. The chief settlements are at Adelaide, Port Adelaide, Albert Town, Port Lincoln, Nepean Bay, Encounter Bay, Gawler Town, Kooringa, and Mount Barker.

SOUTH POLAR COUNTRIES. The southern hemisphere, as is now well known, contains a much less proportion of land to sea than the northern. But it was formerly supposed that the southern hemisphere contained an extensive continent, which surrounded the antarctic pole, and extended to a great distance from it. This imaginary continent, called *Terra Australis Incognita*, makes a conspicuous figure on all maps which are more than a century old. In the middle of the last century, when the spirit of maritime enterprise was active in Great Britain, and the Pacific particularly attracted attention, it was determined to solve the problem of the existence of this Terra Australis, and Cook undertook his second voyage (1772-1775) for the purpose. He attained a latitude of 71° 10′, but found no land S. of 60°.

Thus the matter rested up to 1819, when the South Shetland Islands were seen by William Smith, on a voyage from Monte Video to Valparaiso. This discovery rekindled the spirit of enterprise in Great Britain and other countries. In 1821 Powell discovered Trinity Land, south of the South Shetlands and the South Orkneys, between 60° 30′ and 61° S. lat., and 44° 30′ and 46° 30′ W. long. Palmer, an American, discovered a coast-line west of Trinity Land, which is called Palmer's Land; and the Russian navigator Bellingshausen discovered Alexander's Land, south-west of Palmer's Land. In 1823 Weddell reached 74° 15′ S. lat., but found no new land. In 1831 and 1832 Biscoe sailed round the icy masses which enclose the south pole, and added to former discoveries Enderby's Land and Graham's Land, both on the south polar circle. In 1837 the French government sent some vessels to these parts, under the command of Dumont d'Urville, who explored the coast which Powell named Trinity Land, and changed its name to that of Louis-Philippe's Land. In the following year Balleny directed his course to those parts of the ocean which are south of New Zealand and Australia, and discovered some islands near 165° E. long., which he called Balleny Islands. He also discovered a projecting coast-line near 116° E. long., which was called Sabrina Land. In 1840 Captain Wilkes, an American, found a coast-line in 154° 27′ E. long.: and in continuing his course westward, he had either always a coast in sight or unequivocal indications of land being at no great distance. He advanced as far as 97° 30′

E. long., so that, including Sabrina Land, he discovered a coast-line extending over near fifty degrees of longitude. Dumont d'Urville, in the same year, reached the same coast in 140° 41′ E. long., and pursued his course westward to 130° E. long. He called it Adélie Land.

An expedition was fitted out in England for the purpose of making an attempt to reach the south magnetic pole, and placed under the command of Captain James Clarke Ross. He directed his course several degrees east of Balleny Island, and on the first day of the year 1841 passed the antarctic polar circle, near 178° E. long. On the 11th of January he discovered land near 70° 41′ S. lat., and 172° 36′ E. long., and soon found that it was a continuous coast trending southward, and rising in mountain peaks to the height of 9000 to 12,000 feet, and covered with snow. On the 12th of January he effected a landing, and took possession of it in the name of the queen. He continued his course along the shores to 78° 4′ S. lat. In 77° 32′ S. lat., and 167° E. long., he saw a mountain about 12,400 feet above the sea-level, which sent forth abundance of fire and smoke, to which he gave the name of Mount Erebus. East of this volcano he observed an extinct crater of somewhat less elevation, which he called Mount Terror. At 78° 4′ S. lat. his progress to the south was prevented by a barrier which presented a perpendicular face of at least 150 feet, along which he sailed eastward until he attained 168° 37′ W. long. in 78° S. lat. The coast-line discovered by Ross is above 600 miles. Adding to these the discoveries of Balleny, Wilkes, and Dumont d'Urville, which comprehend a coast exceeding 1200 miles, we find that within two years more than 1800 miles of the coast of the antarctic continent were discovered south of New Zealand and Australia.

The discoverers of these new countries have only in a very few cases been able to effect a landing, the coasts being skirted with a bank of either solid or broken ice, which generally extends from five to ten, and in some places, even to twenty miles from the shore, and the shores themselves being generally lofty.

SOUTH, ROBERT, was the son of a London merchant. He was born at Hackney, in Middlesex, in 1633. In 1648 he was a king's scholar in Westminster School. In 1651 he was admitted a student of Christ Church, Oxford. In 1655, in which year he took his degree of B.A., he wrote some Latin verses congratulating Oliver Cromwell on the peace which he had made with the Dutch. He took his degree of M.A. in 1657. In 1658 he was ordained, and in 1660 made University orator, for which he was perhaps partly indebted to his sermon preached before the king's commissioners, entitled the 'Scribe Instructed' (Matt., xiii. 52). An oration delivered by South, on the occasion of Clarendon being installed Chancellor of the University, led to his being appointed domestic chaplain to that nobleman. In 1663 he was made a prebendary of Westminster, and took his degree of D.D.; and in 1670 he was made a canon of Christ Church, Oxford.

When Lawrence Hyde, the son of Clarendon, was sent as ambassador to Poland, South accompanied him as his chaplain. A long letter from South, dated Danzig, Dec. 16, 1677, to Dr. Edward Pococke, Regius Professor of Hebrew at Oxford, contains his remarks on Poland: it is printed in the volume of his posthumous works (London, 1717). He formed a high opinion of the acquirements and abilities of King John Sobieski. Soon after his return from Poland, South was presented to the rectory of Islip, in Oxfordshire, by the dean and chapter of Westminster. His enthusiastic loyalty and zealous attacks upon the republican party would have obtained for him the highest dignities in the church; but he steadily refused all preferment. Although he disapproved of all James II.'s measures for the restoration of the Roman Catholic religion, yet he refused to join the Archbishop of Canterbury and the bishops in signing the invitation to the Prince of Orange. Nevertheless he was ultimately prevailed on to acknowledge the new government. During the reign of William he continued to refuse preferment with all his former firmness.

South did not like the Act of Toleration, and he exerted himself with the commissioners appointed by the king, in 1689, for a union with dissenting Protestants, in behalf of the Liturgy and forms of prayer. His controversy with Dr. Sherlock, then dean of St. Paul's, who had written a book entitled 'A Vindication of the Holy and Ever-Blessed Trinity,' was carried on with great power of argument, and infinite wit and humour; and South was considered to have been the most successful in the discussion.

South died July 8, 1716. Though he is only known by his sermons, he must be viewed both as a political and a theological writer of no ordinary ability. His 'Posthumous Works' were published in London, 1717, with a Life. His 'Sermons preached on several Occasions' are his chief productions, of which the 3rd edition was published in 6 vols. 8vo., in 1704.

SOUTHAM. [WARWICKSHIRE.]

SOUTHAMPTON, a town in Hampshire, forming a county of itself, a municipal borough, parliamentary borough, and sea-port, is situated on a point of land between the river Itchen on the east, and the Test, or Anton, on the west. These rivers here unite to form the æstuary called Southampton Water. Southampton is 70 miles in a direct line S.W. from the General Post-office, London, or 80 miles by the London and South-Western Railway; in 50° 54′ N. lat. and 1° 24′ W. long.

The Roman town of Clausentum, though not on the exact site of Southampton, may be regarded as its predecessor. Clausentum was on a point of land formed by the winding of the Itchen, on the left or east bank of that river, about a mile N.E. from Southampton.

The foundation of the present town is ascribed to the Anglo-Saxons. There is reason to believe that the castle was early erected by the Saxons. The town was attacked, but without success, by the Danes, A.D. 837; plundered by them A.D. 980;

and again occupied as their winter quarters A.D. 994. In the 'Saxon Chronicle' the town is called Hamtune and Suth-Hamtun; in 'Domesday,' Hantone and Hentune. In the reign of Henry II. it had four churches. Southampton was sacked by the French or Genoese fleet in 1338. The year after this disaster the defences of the town were repaired and strengthened. Richard II. rebuilt the castle.

The county of the town comprehends the whole of the point of land between the rivers, and extends along the bank of the Itchen about three miles. The town is on a gravelly soil, somewhat elevated on the bank of the Test, which washes it on the west and south sides. The principal street (High Street) runs north and south, and is divided into two parts by an ancient 'bar' or gateway belonging to the old town wall, considerable portions of which, with the west gate and south gate, are still standing. That part of the street which is south of the bar was included in the town, and is about half a mile long: the remainder, distinguished as High Street above Bar, or Above-Bar Street, belonged to the suburbs. The other streets or lanes lead from the High Street at right angles or are nearly parallel to it. Several acts of parliament have been passed of late years for the improvement of the town and harbour, and the town is now well paved and lighted, but improvements are still required in the sewerage, and in the supply of water to the habitations of the poorer classes. On the south side of the town is the quay, near which, at the south-western corner of the town, is the pier, a structure of considerable extent and elegance, erected in 1832, and called Victoria Pier, after her Majesty, by whom, before her accession, it was opened. East of the quay is a raised walk or causeway along the shore extending about half a mile. In the more modern part of the town, comprehending Above-Bar Street and the adjacent streets, are some handsome ranges of building. The Winchester road is adorned by a fine avenue of elms, after leaving which it passes through an extensive field of open ground, beautifully wooded, called Southampton Common, affording delightful walks, drives, and rides. The eastern side of the town is occupied by the poorer class of inhabitants; and a road partly lined with houses from the southern part of the town to the Itchen leads to a floating bridge, which forms the communication with Fareham, Gosport, and Portsmouth.

Southampton has five parish churches. Holy Rood Church, a large and ancient structure, has a tower and spire at the south-west angle, and a colonnade or portico, which occupies the whole front. St. Lawrence's Church is small, and almost choked up with the surrounding houses. All Saints' Church is of Grecian Ionic architecture, and is much admired. These churches are all in High Street. St. Michael's, the most ancient of any in the town, is in the west part of the town. It has a tower between the nave and chancel. There are several Norman portions. The windows are chiefly of perpendicular character. St. Mary's Church, in the suburbs east of the town, was rebuilt in the last century. There are two or three other churches, and several places of worship for Dissenters.

Southampton contains, besides the Guildhall, a handsome audit-house, a custom-house, a borough gaol, and a debtors' prison. There are several places of amusement, a theatre, assembly-rooms, a subscription reading-room, circulating libraries, billiard-rooms, and bathing-rooms. There are scarcely any remains of the ancient castle, but a tower has been erected on the site and from the materials of the ancient keep.

The harbour, which is secure, affords good anchorage. Ship-building is extensively carried on, though the vessels built are chiefly small. Southampton has a large coasting-trade, and a considerable trade to foreign ports and the colonies. The customs generally produce about 60,000*l.* a year, gross receipt. In 1849 the specie imported into Southampton amounted to 6,788,655*l.* The number of sailing-vessels registered Dec. 31, 1849, was 210 (13,498 tons). The number of steam-vessels was 11 under 50 tons, and 14 above 50 tons. Very large and convenient docks have been constructed on the eastern side of the town, entirely for the service of steam navigation. In Dec., 1841, the mail-packet steam-ships to the West Indies commenced running. Passengers to the East embark here, there being a direct communication to India once a fortnight, as well as weekly, by steamers, to Vigo, Oporto, Lisbon, Cadiz, and Gibraltar, and daily to the Isle of Wight, France, and the Channel Islands. The South-Western Railway runs to the very edge of the docks, and the trade of Southampton is also promoted by the Andover Canal, which follows the valley of the Anton, and by the navigation of the Itchen, which extends to Winchester. The town contains numerous schools, among which is a free grammar-school founded by Edward VI. There are several ranges of almshouses, a penitentiary or refuge for destitute females, a dispensary, an infirmary, and several other charities. There is a Mechanics' Institution, and also a Literary and Scientific Institution, which has its museum, and rooms where lectures are delivered.

The municipal borough is divided into 5 wards, and is governed by 10 aldermen (of whom one is mayor) and 30 councillors. The parliamentary borough, which returns 2 members, is coincident with the town and county: population, 27,490.

SOUTHAMPTON, COUNTY OF. [HAMPSHIRE.]

SOUTHCOTT, JOANNA, was born in Devonshire about 1750, of humble parents. She was employed, chiefly at Exeter, as a domestic servant, and up to the age of forty or thereabouts seems to have aspired to no higher occupation; but having become acquainted with a man named Sanderson, who laid claim to the spirit of prophecy, the notion of a like pretension was gradually communicated to Joanna. She wrote and dictated prophecies, sometimes in prose and sometimes in rhymed doggrel; her influence extended, and the number of her followers increased; she announced herself as the woman spoken of in the 12th chapter of 'Revelation,' and obtained considerable

sums by the sale of seals which were to secure the salvation of those who purchased them. Exeter became too narrow a stage for her performances, and she came to London on the invitation and at the expense of Sharp the engraver. In 1803 she published 'A Warning to the whole World, from the sealed Prophecies of Joanna Southcott, and other Communications given since the Writings were opened on the 12th of January, 1803,' Lond., 8vo. In 1804 appeared 'Copies and Parts of Copies of Letters and Communications written from Joanna Southcott, and transmitted by Miss Townley to Mr. W. Sharp in London.' In 1813-14 she published 'The Book of Wonders, in Five Parts,' Lond., 8vo.; and also, in 1814, 'Prophecies concerning the Birth of the Prince of Peace, extracted from the Works of Joanna Southcott,' Lond., 8vo. Of the Prince of Peace she announced that she was to be delivered on Oct. 19, 1814, at midnight, being then upwards of 60 years of age. An expensive cradle was made, and considerable sums were contributed. On the night of Oct. 19, a number of persons assembled in the street where she lived, to hear the announcement of the looked-for advent; but the hour of midnight passed over, and the crowd were informed that Joanna had fallen into a trance. On Dec. 27, 1814, she died.

SOUTHERN, THOMAS, was born at Oxmantown, in the county of Dublin, in 1660. He was admitted student of Trinity College, Dublin, March 13, 1676, and in 1678 entered the Middle Temple, London. Preferring poetry to law, he became a writer of plays, the first of which was the 'Persian Prince,' acted in 1682. At the time of the Duke of Monmouth's landing, Southern served in the king's army as ensign in Lord Ferrers's regiment, and was afterwards presented with a company by the Duke of Berwick. At the duke's request he wrote the 'Spartan Dame,' which however was not acted till 1721. After quitting the army, Southern continued to write plays, and enjoyed great popularity. He died May 26, 1746. Southern's language is pure, and free from affectation; his verse has a pleasant fluency, and he has been successful in the expression of simple and natural pathos, particularly in the last scenes of the 'Fatal Marriage,' a tragedy which was popular on the stage in the last century, under the title of 'Isabella.' Some of his plays were published by Tonson, 1721, 12mo., and a complete edition of his works in 1774; they consist of comedies, and of tragedies with an infelicitous mixture of comic scenes.

SOUTHERNWOOD. [ARTEMISIA.]

SOUTHEY, ROBERT, was one of several sons of a linendraper in Bristol, where he was born, Aug. 12, 1774. After some preparatory study he was placed at Westminster School, the expense of his education from this time having been borne by Mr. Hill, a brother of his mother. In 1792 he was sent to Balliol College, Oxford, his uncle's intention being that he should enter the church. But his enthusiastic temperament precipitated him into the opinions which the French Revolution had spread both in France and England; and they went to the extreme of freethinking both in religion and politics. In 1794 he left Oxford. He and a fellow-townsman, a young Quaker named Robert Lovell, in this same year, published a volume of poems, under the names of Bion and Moschus. Lovell had married a Miss Fricker, of Bristol; and in November, 1795, Southey and Coleridge on the same day united themselves to her two sisters. The three had formed a plan to go out together to North America, and there to set up what they called a Pantisocracy, in which they were to live without either kings or priests, and to renew the patriarchal or the golden age. But this plan was never even attempted to be carried into effect. Southey soon after set out for Portugal with his uncle, the Rev. Mr. Hill, who had been appointed chaplain to the English factory at Lisbon. He returned to Bristol in the summer of 1797; in 1798 he removed to London, and entered himself a student of Gray's Inn; but he never prosecuted the study of the law. He was again in the Peninsula in 1800 and 1801, and on his return home in the latter year he went over to Ireland as private secretary to the Right Hon. Isaac Corry, Chancellor of the Irish Exchequer. He retired from office with his patron, and then, returning to England, established himself at Greta, near Keswick, in Cumberland, where he spent the rest of his life.

Long before this time Southey had abandoned his democratic and half-deistical creed, and taken up one diametrically opposite. During the rest of his life, as is well known, he was an ardent, uncompromising, and somewhat intolerant monarchist and churchman, promulgating and maintaining doctrines, both ecclesiastical and political, which were in some respects even something beyond conservative.

In November, 1813, on the death of Mr. Pye, Southey was appointed Poet Laureate; and in 1821 he received the degree of LL.D. from the University of Oxford. In 1835 a pension of 300*l.* a-year was bestowed upon him by the government of Sir Robert Peel. It is understood that he had before this been offered a baronetcy, and that he had also more than once declined being brought into parliament. Having lost his first wife, he contracted a second marriage, June 4, 1839, with Caroline Anne, daughter of the late Charles Bowles, Esq., of Buckland, North Lymington, a lady long known in the literary world. He died March 21, 1843.

Southey's publications are very numerous. His earliest performance of any importance was an epic poem called 'Joan of Arc,' published in 1796. In the following year appeared some 'Letters' from Spain and Portugal. In 1802, 'Thalaba the Destroyer,' a metrical romance, made a considerable impression on the public. 'Madoc,' a poem, in two parts, and the 'Curse of Kehama,' appeared respectively in 1805 and 1810. In 1817 'Wat Tyler,' a dramatic poem, written in a vein of ultra-Jacobinism, in 1794, was surreptitiously published. Among the other literary labours of Southey, both previously and subsequent to this period, may be mentioned 'Amadis de Gaul;' the 'Chronicle of the Cid,' and various

other translations from the Spanish and Portuguese; the 'Life of Nelson,' 2 vols. 8vo.; a 'History of the Peninsular War;' a 'Naval History of England,' in 'Lardner's Cyclopædia;' a 'History of Brazil;' and a 'Life of John Wesley,' 2 vols. 8vo.; 'The Doctor,' which was never acknowledged by Southey, but which is known to have proceeded from his pen, was published in 1834, 1835, 1837, and 1849. A complete list of the large number of works which Southey either wrote or edited would occupy a considerable space. He was a steady contributor to the 'Quarterly Review' from its establishment.

In 1837 'The Poetical Works of Robert Southey,' were collected by himself, 10 vols. 12mo. In 1849 appeared the first volume of the 'Life and Correspondence of the late Robert Southey,' edited by his son, the Rev. Charles Cuthbert Southey, M.A. This interesting work, which is still (1850) in course of publication, contains the fullest information relative to the poet's life and writings.

SOUTHWARK. [London.]

SOUTHWELL. [Nottinghamshire.]

SOUTHWELL, ROBERT, was born in 1560, of an ancient family in Norfolk. He was educated on the Continent, and in 1578 entered the Society of Jesuits at Rome. In 1585 he was appointed prefect of the English Jesuits' College in that city, and was soon afterwards sent to England as a missionary. Here he was accused of being concerned in a plot against the government, and was committed to the Tower. In the course of three years he was ten times subjected to the torture; he at length confessed himself a Jesuit, and that he came to England for the purpose of making proselytes to the Roman Catholic faith. Under the act passed in 1585 (27 Eliz. c. 2), he was tried for treason, Feb. 20, 1595, found guilty, condemned to death, and executed at Tyburn on the following day. His writings, both in prose and verse, were once very popular among Roman Catholics. His principal works are the following:—'A Consolation to Catholics Imprisoned on Account of Religion,' and 'A Supplication to Queen Elizabeth,' Lond., 1598; 'St. Peter's Complaint,' with other poems, 1593; 'Mæoniæ, or certain excellent Poems and Spirituall Hymns,' 1595, 4to.; 'The Triumph over Death,' 1595; 'A Short Rule of Good Life,' 8vo.; 'Mary Magdalen's Funeral Tears,' 1609; 'Epistle of Comfort to those Catholics who lie under Restraint,' 1605, 8vo.

SOUTHWELL, NATHANIEL, became a Jesuit in 1624, and twenty-four years afterwards was made secretary to the General of the Order, which office he held during seventeen years. He died at Rome in 1676, in which year he published his continuation of the 'Bibliotheca Scriptorum Societatis Jesu,' Rome, 1676, folio. The work was afterwards continued by Oudin, who commenced his task in 1738.

SOUZA, MANUEL FARIA E, was born at Souto in Portugal, 1590, of a noble family. Having studied at the University of Braga, he was taken in 1695 as secretary by one of his relations. In 1618 he married and went to Madrid; but his rough manners hindered his advancement at court. In 1632 he was sent on an embassy to Rome, under the Marquis Castel Rodrigo, with whom however he soon quarrelled. On his return to Spain he was arrested at Barcelona by order of the Marquis, and was only released by the intercession of some friends. He then renounced politics, and devoted himself to literature. He obtained a small pension from Philip IV. and the cross of chevalier; but to his pen he trusted for subsistence. He died in 1649, at Madrid.

As a poet, Souza ranks high in Portugal, though most of his works are written in Spanish; but his works are little relished by foreigners, nor have they been translated. His talents were vitiated by the bad taste of the age. As a critic he has long been highly esteemed. Among his works are—'Commentarios sobre la Lusiada,' 1639; 'Epitome de las Historias Portuguesas,' 1626; 'Fuente de Aganipe, varias Rimas,' 1646.

SOUZA-BOTELHO, DOM JOSE-MARIA, born at Oporto, March 9, 1758. His father was governor-general of the province of St. Paul in Brazil. Souza was educated at the University of Coimbra, and in 1778 he entered the army, where he served till 1791. He then became a diplomatist, and was employed by his country in missions to Sweden, Denmark, England, and France, till 1805. He then retired from public affairs, and devoted himself to literature. His edition of Camoens was the result of twelve years' labour. It was completed in 1818. Souza died in 1819.

SOVEREIGN. [Money.]

SOVEREIGNTY. *Supranus* is a low Latin word, formed from *supra*, like *subtranus*, another low Latin word, formed from *subtra*. (Ducange's 'Glossary.') From *supranus* have been derived the Italian *soprano* or *sovrano*, and the French *souverain*, from the latter of which has been borrowed the English word *sovereign*. In the old English writers the word is correctly spelt *soverain* or *soverein* (Richardson's 'Dict.') The received orthography seems to be founded on the erroneous supposition that the last syllable of the word is connected with *reign*, *regnum*.

In every society some person or persons must possess or exercise the supreme or *sovereign* power.

The marks by which the possession of the sovereign power may be distinguished are mainly two, the one positive and the other negative, viz.:—

1. A habit of obedience to some determinate person or persons, by the community which he or they assume to govern.

2. The absence of a habit of obedience, on the part of the same person or persons, to any person or government.

The sovereign powers include all the powers which can be exercised by a government. They include the legislative power, the executive power, the power of declaring peace and war, and of concluding treaties with foreign states, the power of making contracts with private individuals, and the power of instituting inquiries.

The sovereign power is unlimited by any legal check or control. The securities for its beneficial

exercise are derived exclusively from the balance of interests and the influence of public opinion.

Sovereign or supreme governments are divided into Monarchies and Republics; and Republics are divided into Aristocracies and Democracies.

SOW-THISTLE. [SONCHUS.]

SOWING. The sowing of the seed has always been looked upon as one of the most important operations of husbandry. Much of the success of the future crops depends on the time and the mode in which the seed is committed to the earth. After the land has been well prepared by judicious tillage and manuring, many accidents and circumstances may disappoint the hope of the farmer, and the crop may be scanty or fail altogether. The weather and the seasons are not under his control; but still much depends on his own judgment and skill. If he selects the best seeds, chooses the proper season for sowing them, and has them carefully distributed and properly covered with earth, as their nature requires for the most perfect germination, and thus also protects them from the voracity of birds or insects, he will have a much greater prospect of success, under all circumstances, than if he were careless or negligent.

The most common mode of sowing the seed is by scattering it as evenly as possible over the ploughed surface, as it lies in ridges from the plough. The harrows follow, and crumbling down the ridges, cover the seed which has fallen in the hollows between them. It requires an experienced sower to scatter the exact quantity over a given surface, without crowding the seed in one spot, and allowing too great intervals in another. Hence the farmer who does not himself sow the seed, invariably chooses the most experienced and skilful labourer to perform this work. Notwithstanding every care and attention on the part of the farmer or master, the labourer will often relax and become careless, and the result appears only when it is too late to remedy it. This has given rise to the various attempts which have been made to invent machines for sowing the seed, such as should insure perfect regularity. [DRILLING.]

SOY. [SOJA HISPIDA.]

SOYA, or SOWA, an umbelliferous plant cultivated in India. It is the *Anethum Sowa* of Roxburgh, of which the aromatic seed is much used by the natives in cookery, as well as for medicinal purposes; the green parts also are cut down, and sold in the bazars, as the plant is used as a vegetable both by Mussulmans and Hindoos.

SOYMI'DA, a genus of plants of the natural family of *Meliaceæ*. *Soymida febrifuga* is a large forest-tree, a native of the mountainous parts of Hindustan, where it is particularly noted on account of its bark. This is of a dull red colour, of a fibrous nature, and astringent, and has been much employed there for the cure of intermittent fevers.

SOZO'MENUS, HERMIAS, a church historian of the fifth century, was born in Palestine. He was educated in a monastery, and, after studying law at Bérytus, went to Constantinople, where he practised as an advocate, and also wrote in Greek his 'Church History,' which consists of nine books, and embraces the period from 323 to 439 A.D. He is superior to his contemporary Socrates in his style; but in other respects there is such a close resemblance between the works, that Sozomen, who was the younger of the two, is supposed to have seen the work of Socrates, and to have used it without acknowledgment. He is deficient in judgment and makes many chronological errors. Sozomenus lived in the reign of Theodosius II., to whom he dedicates his history. The History of Sozomenus is printed with all the editions of Socrates.

SPA. [LIEGE, Province.]

SPACE AND TIME. (*Mathematics.*) We do not here propose to enter into any discussion of the doctrines of metaphysicians upon the idea of space, or whether it is innate or acquired. Space and time are essential to thought, and are, come by the notions how we may, necessary attendants on our own consciousness of existence. It is possible for imagination to picture the annihilation of all things, itself included, or to fancy that it can form such a picture, which is the same thing; but what then would remain (in the thoughts)? Infinitely extended empty space, lasting through infinitely extended time.

In these ideas we have the foundation of the mathematical sciences; for from space follows form, which is the conception of the manner in which one part of space is separated from the rest, and from the investigation of forms arises geometry. Again, time is only apprehended by succession of events or ideas, and succession or repetition gives the notion of *numbering*. And though *collection* is sometimes stated to be the leading idea in *number*, which may be the fact, yet it may be asserted that number in the last sense is not the object of arithmetic, except as furnishing the subject of numbering. The leading phrases of arithmetic suggest the idea of time, and are derived from it. How often is 2 contained in 12? Six times. The 2 presented to the thoughts at six different times is the mode in which the collection of 12 is counted by twos.

From both space and time we get the notion of direction, but in very different manners. The extremities of a portion of space give the idea of a point of space, a fundamental notion of an indivisible index of commencement or termination. The extremities of time give the notion of points of time, or indivisible portions of duration. No point of space contains any space; no point of time lasts any time. If we choose a point of space or a point of time, we can in our thoughts set out from the former in an infinite number of different ways; from the latter, in only two. This is the law of thought, upon which it is useless to speculate; but it is followed by important consequences.

From space and time also we get the idea of infinity. That space and time are unbounded, is the simple consequence of their being necessary to our notion of the existence of anything: we speak of our conceptions of them. For if it could be imagined that space ceased at a certain boundary,

it would be as easy to make it cease in our own neighbourhood; and if duration could be imagined to have an end, it would not be difficult to place ourselves in thought within five minutes of that end.

If we estimate the reality of a conception by its necessity, which is what we do when we settle the pre-eminence of space and time among our ideas, then it is certain that the conception of infinity is as real as that of space or time, being essentially united with them. Many mathematicians try to deny this, and substitute various modes of speaking to avoid the introduction of the idea. It is true that the notion of infinite is one which it is difficult to use without falling into error—a very good reason for avoiding it until the understanding has been well practised in mathematical deduction, but none for denying its existence.

SPA'DA, LIONELLO, was born in Bologna, of poor parents, in 1576. He was employed whilst a boy as a colour-grinder by the Caracci; and being led to attempt design, first adopted the style of their school. He afterwards became the scholar of Baglione, and contracted a friendship with his fellow-scholar Dentone. From Dentone Spada learnt perspective. He afterwards went to Rome, and became the scholar of Caravaggio, who then, as the rival of Cesari, was at the height of his reputation. Spada accompanied Caravaggio to Malta, and returned to and established himself at Bologna, master of a new style as bold as Caravaggio's, but less vulgar, and softer and more harmonious. His numerous works now gained him a great reputation, and he was appointed court painter to the Duke of Parma. He died in 1622.

Spada superintended the decorations of the theatre of Parma. The generality of his compositions are half-figures, of the natural size, after the manner of Caravaggio and Guercino. His masterpiece is generally considered to be the great picture of San Domenico burning the proscribed books of the heretics, in the church of that saint at Bologna. Spada wrote verses, some of which have been preserved by Malvasia, who has also recorded various specimens of the painter's humour and turn for satire.

SPADIX, a form of the inflorescence of plants, in which the flowers are closely arranged around a thick fleshy axis, and the whole surrounded by a large leaf or bract called a spathe. The flowers of the *Arum maculatum*, Cuckoo-Pint, or Wake-Robin, are arranged in this manner.

SPAGNOLETTO. [RIBERA.]

SPAIN (*España*), a country in Europe, occupying the greater part of that peninsula which is divided from France by the mountain-range of the Pyrenees. It is situated between 36° and 43° 46′ N. lat., and 2° 15′ E. long. and 9° 10′ W. long. The most northern point is Cape Ortegal (43° 46′ N. lat.), and the most southern Tarifa (36° 2′). From its most north-western point, Cape Finisterre, to the most eastern, Cape Creus, is a distance of nearly 600 miles; from Tarifa to Fuentarabia, near the boundary of France, on the Bay of Biscay, nearly 540 miles; and from Cape Ortegal to Cape de Gata, the most south-eastern promontory, about 556 miles. The area of Spain is nearly 190,000 square miles.

Spain is bounded on the E. by the Mediterranean, on the S. by the Mediterranean and the Atlantic, on the W. by Portugal, on the N.W. by the Atlantic, on the N. by the Bay of Biscay, and on the N.E. by France.

Coast.—The coast-line of Spain, without taking into account the numerous small inlets, is 1370 miles, of which 602 are washed by the Atlantic and 768 by the Mediterranean. The northern coast of Spain, from the boundary of France to Cape Ortegal, runs nearly in a continuous line with few considerable breaks. Most of the indentations are narrow inlets of no great length, which are used by small coasters. These inlets go by the name of *rias*, as they generally constitute the mouths of small rivers. The whole line is rocky, and the rocks nearly always approach the sea, where they form a mural line varying in height between 30 and 300 feet. From Cape Ortegal to the mouth of the Minho, the coast is less elevated, though it is rocky, and presents numerous headlands and inlets, of which the most remarkable is the Bay of Betanzos, which divides into three inlets, which form the harbours of Ferrol, Betanzos, and La Coruña. South of Cape Finisterre are four rather large bays, called Ria de Muros y Noya, Ria de Arosa, Ria de Pontevedra, and Ria de Vigo, all of which are deep and have good anchorage. Along this line of coast there occur several small rocky islands.

The coast-line of the Atlantic, between the mouth of the Guadiana and the Punta de Europa, is of a different character; it is almost wholly low and sandy, and in many parts swampy. The coast of the Mediterranean from Punta de Europa to Cabo de Palos is in general elevated and rocky. This extensive line of rocky coast has no indentations, and no harbour which vessels of moderate size can enter, with the exception of the excellent harbour of Cartagena, and the harbour of Malaga. At Cabo de Palos a low and sandy coast begins, which extends as far north as Cabo de Santa Pola, a short distance south of Alicante. It has no harbours even for small vessels or large boats, though it is intersected by several creeks, which in some places form small lagoons. The nature of the coast between Cabo de Santa Pola and the mouth of the Ebro varies considerably, but is for the most part low. From the mouth of the Ebro to the boundary of France the coast is alternately high and low, and both the low and the high shores generally continue for many miles; in this part occur the two large harbours of Barcelona and Rosas.

A short distance from the eastern coast of Spain lie the Balearic Islands, which belong to Spain. [BALEARIC ISLANDS.] The largest island, *Mallorca*, or *Majorca*, has an area of 1352 square miles, and contains a population of about 180,000. *Palma*, the capital, situated on the south side of the island, at the bottom of Palma Bay, has a tolerably good harbour, and contains a population of about 35,000. It is the seat of a university, and of the supreme court for the government of

the Balearic Islands. *Menorca*, or *Minorca*, the island next in size, has an area of 242 square miles, and contains a population of about 45,000. *Port-Mahon*, on the east side of the island, has a deep and excellent harbour, but the access is somewhat difficult and occasionally dangerous. The town, which is well-built and strongly fortified, has 16,000 inhabitants, who are actively engaged in commerce. Port-Mahon was declared a free bonding port for all kinds of goods in Nov., 1849, and it is the custom-house station authorised to admit foreign goods into Spain. The isle of *Iviza* has a population of 25,000, and is famous for its salt-works: *Iviza*, the chief town of the island, has 6000 inhabitants.

Surface and Natural Divisions.—Spain presents greater and more marked differences in the form of its surface than any other country of Europe of equal extent. The interior is an elevated table-land, whose surface is from 2000 to 3000 feet above the sea-level, higher than any other table-land of Europe. The table-land comprehends nearly the whole country which lies between 38° and 43° N. lat., and extends from near 1° to near 8° W. long. Spain consists of six great natural divisions—the Table-Land, the Northern and Western Maritime Region, the Basin of the Ebro, the Eastern Declivity, the Basin of the Guadalquivir, and the Mountain-Region of the Sierra Nevada.

I. The *Table-Land* comprehends the eastern districts of Galicia, the whole of the kingdom of Leon, three-fourths of that of Old Castile, the whole of New Castile and Estremadura, the south-western districts of Aragon, and the northern districts of Murcia; it covers about one-half of Spain. The table-land is nearly surrounded by mountains. Along its northern edge rise with a steep ascent the mountains of Asturias, which in elevation nearly rival the Pyrenees, but occupy a smaller extent of country; there are many peaks from 6000 to 9000 feet in height, and one, the Sierra de Peñaranda, is 11,000 feet. The high grounds which divide the table-land from the basin of the Ebro cannot be considered as a mountain-ridge in all their extent; since the series of mountains is broken in several places as it sweeps round towards the southern border of the table-land, which forms the range, or rather mountain-region, called the Sierra Morena. The Sierra Morena consists of a great number of short ridges, running south-west towards the east, and south-east towards the west. These ridges, which enclose very narrow valleys, are connected by other ridges, lying frequently along their northern extremity or close to the extremity of the table-land, but sometimes also in the middle of the mountain-region.

Other mountain-ranges occur on the table-land itself. One of them constitutes a continuous range, traversing the plain in all its extent from east to west. It is known in different parts by the several names of Sierra de Deza, Somasierra, Sierra de Guadarama, Sierra de Avila, Sierra de Gata, and Sierra d'Estrella; the highest point is Sierra de Gredos, 10,548 feet. The table-land is divided by this mountain-range into two parts, which do not differ much in extent. That portion which lies north of it forms the table-land of Old Castile and Leon, and the other part south of the range forms the table-land of New Castile and Estremadura.

The northern table-land is mountainous in its north-west corner, being traversed by ranges separated by elevated valleys. The remainder is a plain, stony and sandy, of little fertility. The lower tracts are entirely destitute of trees, and generally even of bushes. The hills are partly overgrown with light thin woods and numerous low bushes; but near the banks of the rivers the soil is more fertile.

The southern table-land is much more diversified by hills and mountains than the northern. The mountain-chains are of considerable extent, but they do not form continuous ranges, being interrupted by several depressions, which sink nearly to the level of the country. In the eastern districts of the table-land is the Sierra Molina, which is of very inconsiderable width, but it constitutes the watershed between the rivers which fall into the Mediterranean and those that run to the Atlantic. West of Cuença a ridge of low mountains branches off from the Sierra de Molina, and runs westward, dividing the upper branches of the Tajo from those of the Guadiana. The Sierra de Toledo seems to rise west of 4° W. long., and to extend to 5° W. long., running east and west; near 5° W. long. it sinks down to the level of the plain, but another range rises out of it, called the Sierra de Guadalupe, which extends westward to the boundary of Portugal. The eastern part of this table-land is the highest. The surface is very uneven, with the exception of the higher ground between the river-basins, which in some places extends in plains, and in others is diversified by numerous hills or low ridges. A very small portion of this region, which lies in the valleys along the rivers, and in some depressions of the plain, is under cultivation. The central region of the table-land is between 3° and 5° W. long. It consists of two plains, the Plain of Madrid and Toledo, which lies north of the mountains of Toledo, and the high broken ground which forms the watershed between the rivers Tajo and Guadiana; and the Plain of La Mancha, which lies to the south. These two plains are more fertile than the district just described. The western portion of the table-land comprehends the country from 5° W. long. to the boundary of Portugal, or the province of Estremadura. This country has a very mountainous surface, and has many gradations of fertility in different parts.

Rain is comparatively scarce on the table-land of Spain. The rain generally falls in the winter, and only a few showers occur in other seasons. In summer excessive heat, and in winter a great degree of cold, are experienced, the range being from 10° to 90° Fahr. With the exception of the injurious effects of such changes in the temperature, the climate of the table-land is very healthy.

II. The *Maritime Region* of the Atlantic and Bay of Biscay surrounds the table-land on the north-west and north, and contains the western districts of Galicia, the province of Asturias, and

the northern portion of Old Castile. That portion which lies south of Cape Ortegal is hardly more than 40 miles in width, and is traversed by numerous ridges, which have usually gentle slopes, so as to admit of cultivation to a considerable distance from their base. The climate is moist, and the cultivation tolerably good. The country between Cape Ortegal and Cape Ajo is of a different character; the mountain slopes are much more rapid, and the fertile spots confined within narrower width.

III. *The Basin of the River Ebro* occupies a part of Old Castile, the province of Alava, the kingdom of Navarre, the greater part of Aragon, and a considerable portion of Catalonia. The northern boundary, from the sources of the river Segre on the east to those of the Arga on the west, is formed by the high chain of the Pyrenees; and a considerable part of the country north of the Ebro is covered with branches of the Pyrenees, between which are numerous valleys. The countries within the basin of the Ebro south of the river contain a much larger proportion of arable land, and are much more populous than those on the north of the river. That part of it which extends between Logroño and the mouth of the Xalon, from the banks of the river southward to the base of the Sierra de Cameros, is probably the most fertile tract in the interior of Spain. The country which extends between the Sierra de Llena and the Mediterranean, and the lower course of the Ebro, may be considered an appendage of the basin of the Ebro. With few exceptions, the surface is very hilly, and in some parts even mountainous, as in the vicinity of Vique. The ridges of hills which traverse it run partly parallel to the Sierra de Llena, and partly in an opposite direction towards the Mediterranean. The fertility is various.

The countries included in the basin of the Ebro differ greatly in climate, the valleys within the Pyrenees being so cold that the common kinds of grain do not succeed, while along the sea-shore and towards the mouth of the river most of the fruits of southern Europe attain perfection.

IV. The *Eastern Declivity* extends from the mouth of the Ebro to Cabo de Palos, and contains four regions, which differ in their natural features and productive powers. The most northern extends from the Ebro to Murviedro. Along the sea-shore there is a narrow strip of level ground, hardly more than two or three miles wide, which in a few places is interrupted by low hills. It is generally fertile, and in some places highly fertile. South of this hilly country is the plain of Valencia, which is abundantly irrigated, and the whole is under cultivation. The country south of the plain, extending along the sea-shore from Gandia to the vicinity of Alicante and Elche, is extremely broken. It may be considered the most eastern offset of the great table-land; its fertile land is small in quantity; but as this tract has become the seat of an extensive manufacturing industry, all the arable land is cultivated with the greatest industry, and the crops of maize and corn are tolerably abundant. South of this mountainous region the eastern declivity extends much farther inland. It contains many highly fertile spots, in the valleys between mountain-ridges which rise 4000 or 5000 feet in height. This region, more than any other part of Spain, is subject to earthquakes. It also suffers from want of moisture. Sometimes it does not rain all the year round, but the rivers always yield a plentiful supply of water for irrigation.

V. The *Basin of the River Guadalquivir* lies between the great table-land and the mountain-region of the Sierra Nevada. On the north is the Sierra Morena, and on the east the Sierra de Segura and that of Cazorla. The mountains which constitute the southern boundary-line run along 37° 35′ N. lat. east of 4° 30′ W. long., but west of that meridian they decline to the south-west and terminate on the Atlantic in Cape Trafalgar. The eastern portion of the basin is traversed by several ridges which branch off from the Sierra Morena and the Montes de Granada. The central part is only mountainous to the north of the Guadalquivir, where several ridges of the Sierra Morena approach to the banks of the river. The tracts south of the river are diversified by long and broad swells, which usually rise with a gentle slope, and have only steep sides where they approach the Montes de Granada. The lower basin extends from 5° W. long. to the Atlantic, and is extremely diversified in surface. The district near the mouth of the Guadiana is hilly; that which lies south of the road between Sevilla and Ayamonte is almost a desert waste; while the most southern corner, which surrounds the Bay of Cadiz, is famous for its vineyards, large plantations of olive-trees, sugar-canes, and cochineal.

VI. The *Mountain-Region of the Sierra Nevada* extends over the most southern part of Spain, lying along the sea which divides Spain from Africa, and along the Strait of Gibraltar. Its northern boundary on the east is marked by elevated ranges, extending east and west near 37° 25′ N. lat. The most eastern is called Sierra de Aguaderas, then follows the Sierra de Estancias, and farther west the Montes de Granada, which reach to the towns of Cabra and Lucena, near 4° 30′ W. long. From this point to the Atlantic near Cape Trafalgar, or rather Torre de Roche, the boundary runs south-west, and is not formed by a distinct ridge, but by a mountainous tract consisting of the offsets of the Sierra de Cabras and Sierra de Ronda. This mountain-system covers nearly 12,000 square miles, and contains two regions, a more elevated one to the east of 4° 20′ W. long., and a lower one west of that line.

The centre of the more elevated region is occupied by the Sierra Nevada, a lofty range of mountains running east and west, and about 10 miles wide. The highest part is the Pico de Mulhaçen, which is the highest mountain in Spain, and attains 11,666 feet above the sea-level; west of it stands the Pico de Veleta, which rises to 11,387 feet. Many minor chains branch out from the central mass. South of the Sierra Nevada are the Alpujarras, a name which properly indicates a range of mountains that runs parallel to the great chain and the shores of the sea, nearly half-way

between them. They do not attain a greater height than 5000 feet. These mountains are characterised by a rich vegetation which clothes their northern declivity. The river Guadalfeo is considered the western boundary of the Alpujarras, but the range of mountains continues westward, and attains a height of nearly 8000 feet. Along the northern base of the Sierra Nevada extends the plain of Granada, which is famed for its natural richness and picturesque beauties, and its relics of the Moorish times. [ALHAMBRA; GRANADA.] North of the plain are the southern slopes of the Montes de Granada, which are traversed by many fertile valleys.

The mountain-region which begins west of the plain of Granada and the Sierra Nevada, extends south-west, occupying the whole of the tract between the Mediterrnean and the river Guadalete, which falls into the Bay of Cadiz. It terminates on the west between Torre de Roche and Tarifa. Nearly in the middle of it runs an elevated tract about 10 miles wide, which however is not immediately connected with the Sierra Nevada, but rather with the Sierra Tejada. The Sierra Nevada generally has copious rains and a powerful sunshine, which produce in many parts an abundant vegetation.

Rivers.—Spain is drained by a great number of rivers, and some of them run for several hundred miles; but only a very few are navigable for small boats, and that only towards their mouths. But though the rivers of Spain are nearly useless for the transport of its productions, they are of great importance for fertilising the ground by irrigation. This practice is nearly general in all the countries which extend along the Mediterranean, and in the basin of the Guadalquivir.

The largest rivers are noticed under their proper heads. [DOURO; EBRO; TAGUS.] We shall here briefly mention a few others.

The *Miño*, or, as it is called by the Portuguese Minho, rises with numerous branches in the north-eastern districts of Galicia; it runs in a southern direction to Orense, beyond which it runs mostly south-west, and from Melgaço to its mouth it constitutes the boundary-line between Spain and Portugal. Its course is about 160 miles. The *Guadiana* rises with numerous branches on the table-land of Cuença, between 2° and 3° W. long., and 39° and 40° N. lat. It runs for more than 120 miles westward through the plains of La Mancha, without being joined by any considerable affluent. It begins to form the boundary between Portugal and Spain near Badajoz; and after running about 30 miles along the boundary in a south-south-western direction, it enters Portugal; but it again forms the boundary lower down. Its course is about 450 miles, and it receives the Giguela, Zujar, Chanza, and other streams. The *Guadalquivir* originates in the Sierra de Cazorla, east of 3° W. long., and near 37° 50′ N. lat.; and after a course of about 30 miles, mostly west, it is met by the Guadiana Menor. At the town of Sevilla the Guadalquivir changes its south-western course into a nearly southern course, which it follows to its mouth in the sea at San Lucar de Borrameda. The whole

course of the Guadalquivir falls short of 300 miles. It receives the Guardarmena and the Xenil, and lower down forms two large swampy islands, Isla Mayor and Isla Menor. The *Segura* rises in the Sierra de Segura, north of the source of the Guadalquivir, and passes by Murcia to the Mediterranean. It has a course of 200 miles. The *Xucar* rises on the elevated plain of Cuença, and runs for more than 100 miles, mostly south, in a broad and moderately fertile valley, without receiving any tributary; it then gradually turns to the east, and enters the sea after a course of 200 miles. The *Guadalaviar*, or *Turia*, rises on the north-eastern edge of the table-land, and after a course of 150 miles, falls into the Mediterranean near Grao, where there is a bad roadstead.

Productions.—The most common kinds of grain which are cultivated in Spain are wheat, maize, barley, and rice. Other objects of agriculture are hemp and flax, especially in the basin of the Ebro, and madder and saffron on the table-land of Cuença. In the southern districts the sugar-cane and cotton are cultivated. The most common vegetables are onions, garlic, pumpkins, cucumbers, melons, water-melons, potatoes, beans, and peas. Many fruit-trees are cultivated, as almonds, figs, pomegranates, lemons, oranges, pistachia nuts, carobas, dates in the southern districts, walnuts, hazel-nuts, and especially chestnut-trees, which in some of the northern districts cover large tracts. Olive-trees occur in all parts, except the northern mountain tracts, and the vineyards are extensive, except on the most elevated regions. Several of the Spanish wines are considerable articles of commerce, as Xeres (Sherry), Malaga, Alicante, Malvasia, Tinto, and Val de Peñas. Brandy and raisins also are articles of export. Among the wild trees are the sweet-acorn oak, the cork-tree, the kermes oak, and the sumach-tree. On the Montañas de Asturias and Aralar, and also on the western offsets of the Pyrenees, there are large forests of fine timber-trees. The liquorice-plant is abundant in the vicinity of Sevilla and near the mouth of the Ebro, and the prepared juice is sent to all parts of Europe.

Among the domestic animals the sheep and horses are distinguished. The sheep are noted for their fine wool, which forms an important article of export. The horses of Spain, and especially those of Andalusia, are noted for their beauty. Cattle are only numerous and of large size near the higher mountain-ranges; in other parts they are small. The asses and mules are distinguished by their size and beauty. Pigs are not very numerous. Goats are more numerous than in any country of Europe, especially on the table-land. There are wild cattle in the mountain-region of the Sierra Nevada, chamois in the Pyrenees, and porcupines in many places. The mountains also contain wolves, bears, lynxes, wild cats, and martens, the last especially in Biscay. Chameleons are found near Cadiz, and monkeys on the rock of Gibraltar. In no country of Europe, except Italy, is so much silk obtained as in the eastern and southern provinces of Spain. The cochineal insect has been reared of late years in Andalusia, Granada, and Estremadura, and thrives

well. Bees are very abundant, and much honey and wax are obtained. Only a few kinds of fish are met with in the rivers; but the fishery in the Atlantic is important.

Spain abounds in minerals. Gold and silver are known to exist in several places. Platinum and copper are met with. A rich mine of quicksilver is worked near Almaden. Lead is very abundant, especially in the Sierra de Gador. Iron-ore is very abundant in the Sierra de Aralar and other places. There are also tin, calamine, bismuth, cobalt, alum, vitriol, and sulphur. In some parts large quantities of saltpetre are collected. Coal occurs in the Montañas de Asturias and in the Sierra Morena, but it is not much worked. Many kinds of marble are got in Catalonia. Several precious stones are found, as rubies, topazes, amethysts, turquoises, and garnets. Salt is got near Cardona in Catalonia, from the lagune called the Albufera de Valencia, and from the sea-water along the coast between Cape Trafalgar and the boundary of Portugal.

Political Divisions, Population, Education, &c.—In former times Spain was divided into fourteen large provinces, of which some, as Granada, Sevilla, Jaen, Murcia, and Valencia were called kingdoms. It is now divided into the following forty-nine smaller provinces:—Alava, Albacete, Alicante, Almeria, Avila, Badajoz, Baleares, Barcelona, Burgos, Caceres, Gadiz, Canarias, Castellon de la Plana, Ciudad Real, Cordoba, Coruña, Cuença, Gerona, Granada, Guadalajara, Guipuzcoa, Huelva, Huesca, Jaen, Leon, Lerida, Logroño, Lugo, Madrid, Malaga, Murcia, Navarra, Orense, Oviedo, Palencia, Pontevedra, Salamanca, Santander, Segovia, Sevilla, Soria, Tarragona, Teruel, Toledo, Valencia, Valladolid, Vizcaya (Biscay), Zamora, Zaragoza.

The population of Spain in 1833 was 12,386,841. We are not aware of any later census. The above number included the Balearic and Canary Isles. The American colonies contained 1,020,862 inhabitants; the African 17,071; and the Australasian 2,679,500; making, with the mother country, a total of 16,104,274.

The established religion is the Roman Catholic, and no other is allowed in the Spanish dominions. The crown presents the archbishops and bishops, who are confirmed by the holy see. The wealth of the church was at one time immense. In 1780 the revenues of the archbishop of Toledo amounted to about half a million sterling. Since the Revolution the clergy have been deprived of the tithes; the monastic orders have been suppressed, and the convents and the lands belonging to them sold; but the convents of nuns were suffered to remain till the death of the occupants.

Education is not generally diffused. The lower classes have little or no instruction at all. Formerly education was almost entirely in the hands of the regular clergy or of the Jesuits, who had colleges in the capital and in the principal cities of the Peninsula; but the suppression of that and the other monastic orders has been in this respect severely felt by the public, as no effectual provision has yet been made by government to supply the place of the schools and colleges formerly kept by them. The universities of Salamanca, Valladolid, Santiago, Alcalá, Zaragoza, Huesca, Cervera, Sevilla, and Toledo, are now greatly reduced, and are chiefly attended by students destined for the church.

Colonies, Trade, &c.—The only colonies now remaining to Spain, of her once extensive dominions in America, are the islands of Cuba and Puerto Rico. She also possesses the Philippine Islands in Asia, and the fortresses of Ceuta, Melilla, and Peñon de la Gomera on the northern coast of Africa, which are used as places of transportation for convicts. The islands of Fernando Po and Annabon, on the western coast of Africa, also belong to her.

No country of Europe equals Spain in natural commercial advantages, whether we consider its situation or its products. The coasts are extensive, and the ports numerous and commodious; the inhabitants, inured to a warm climate, visit the tropical regions with comparative safety; yet it is far behind most other countries of Europe in commercial importance. During the 17th century most of the Spanish trade with America was carried on in Dutch or English vessels; and, with the exception of wine, wool, and oil, few if any of the productions of the Peninsula found their way to that market. About the close of the last century, under the enlightened administration of Count Florida Blanca, Spanish commerce revived, and several manufactures were established throughout the country. These however were all destroyed during the Peninsular war; and the subsequent separation of the American colonies from the mother country has completely annihilated the maritime trade of Spain. At present Catalonia is almost the only province of Spain where manufacturing is carried on to any extent. The chief exports of Spain consist of wines, dried fruits, corn, oil, wool, quicksilver, lead, and some iron. The silk of Valencia, which is equal to that of Italy, is bought by the French manufacturers.

Government and Constitution.—The government of Spain during the early part of the middle ages was absolute, but the power of the king, after 1169, when the first Cortes was held at Burgos, was more restricted than in any other country of Europe. Ferdinand the Catholic aimed the first blow at Spanish liberty, by avoiding, as much as possible, the convocation of the Cortes. His successor, Charles V., completed the ruin of the Cortes, by entirely disregarding their petitions, and defeating the citizens who rose in arms to support the cause of national liberty. Spain continued to be ruled despotically by the kings of the houses of Austria and Bourbon until the French invasion in 1808, when the deputies of the several provinces assembled at Cadiz, and framed a new constitution, which was sworn to and promulgated in 1812. At the close of the war however, Ferdinand VII., who had recovered his liberty, refused to give it his sanction, and he re-established the old forms of government; but being compelled soon after (1820) by a military insurrection, at the head of which was General Riego, to swear to the constitution of 1812, it again became the law of the land, until it was a

second time put down with the assistance of a French army.

On the death of Ferdinand (1832), his widow, Queen Christina, wishing to conciliate the liberal party, gave the nation a new charter (Estatuto Real), and re-established the ancient Cortes of the kingdom, with some slight modifications. After various minor changes a new constitution was established, in 1837, by which two chambers were instituted—that of the *Diputados* and that of the *Senadores*—the members of which are invested with equal powers, but all bills relating to taxation are to be presented in the first instance to the Lower Chamber.

History of Spain.—The history of the Peninsula may be divided into four periods.

I. *Spain before the Invasion of the Arabs.*—The history of the Peninsula, previous to the settlements of the Carthaginians, is unknown. The earliest inhabitants mentioned by the Greek and Roman historians were the Ibéri. The Iberi were disturbed in their possessions by the Celtæ, who settled in the northern districts. In many places however, but chiefly in the central districts of the Peninsula, the two races seem to have been amalgamated, and to have formed only one nation, known as the Celtiberians. [CELTIBERI.] The Phœnicians seem to have had commercial intercourse with the southern coast of Spain before the foundation of either Rome or Carthage. As they became acquainted with the country, they penetrated into the interior, where they founded Kartabah (now Cordova), and explored the mountainous districts of Navarre in search of iron. The Rhodians visited the shores of Catalonia, and founded a town, which they called Rhode (now Rosas). They were followed by the Phocæans, who founded the town which is now named Denia, and probably also that of Chersoneus (now Peñiscola), on the same coast, and who, having in time dispossessed the Rhodians, extended their settlements along the shores of Valencia. There were other Greek settlements, the names of which may still be recognised in their modern appellations, as Emporion, now Ampurias. The Carthaginians made an unsuccessful attempt to conquer the country, which led to the second Punic war. [PUNIC WARS; SCIPIO.] Spain afterwards became a Roman province, and was divided into Citerior and Ulterior, the Iberus or Ebro being a boundary between them. By native insurrection and the Roman civil wars, Spain was kept in a constant state of warfare till the reign of Augustus. Augustus himself visited Spain, and he divided the country into three great provinces, Bætica, Lusitania, and Tarraconensis, a division which subsisted till the reign of Constantine the Great. During this period Spain was considered one of the most valuable and flourishing provinces of the empire. According to Pliny, it contained 360 large cities.

About the beginning of the fifth century, the Suevi under their king Hermeric, the Alans under Atace, and the Vandals or Silingi under Gunderic, after overrunning the provinces of Gaul crossed the Pyrenees, and settled in the Peninsula. The Suevi were ultimately overcome by the Goths, who, in the time of Euric (466-83) became masters of the Peninsula. Euric was the first legislator of his nation, and the laws which he collected or promulgated became in after time the foundation of the 'Forum Judicum' or 'Fuero Juzgo.' After the death of Amalric, who fell in battle against Clovis, king of the Franks (531), the Gothic kings appear to have been either elective or hereditary according to circumstances. In 672 the throne of Gothic Spain was occupied by Wamba, a monarch distinguished by his virtues and abilities. The Saracens of Africa having attempted to land at Gibraltar, Wamba fitted out a fleet and defeated them. He was succeeded by Ervigius, and Ervigius by Egica. Egica associated his son Witizia in the empire, whose depravity and misgovernment reduced the country to the most deplorable condition. He was dethroned by Roderic, under whose reign (A.D. 711) the Arabs of Africa, commanded by Tárik Ibn Zeydá, crossed the straits, and, after defeating the whole force of the Gothic monarchy on the banks of the Guadalete, took the capital, Toledo. [MOORS.]

II. *Spain divided into Kingdoms* (from 711 to 1518).—Músa Ibn Nosseyr reduced the whole of Spain to the sway of Islám, with the exception of the mountainous districts of the Asturias, where the prelates and chiefs of the Goths fled for refuge. It was from those mountains that a Gothic nobleman, named Pelayo, attempted to rescue his country from the yoke of the infidel. He founded the small kingdom of the Asturias, which he transmitted to his son and successor, Favila, in 737. Alfonso, surnamed the Catholic, who succeeded Favila (739), made ample additions to his territories. He was succeeded by his eldest son Fruela (757), and Fruela by Aurelio (768). In the meantime another Christian kingdom was rising into existence in the recesses of the Pyrenees. In 758 Garcia Ximenez was proclaimed king by the inhabitants of the country of Sobrarbe, which became in time the foundation of the two kingdoms of Navarre and Aragon.

About the beginning of the ninth century, Wifrid, a governor of the Spanish March for the French, assumed the title of count of Barcelona. Nearly two centuries after (1005) the province of Bardulia, which, from the numerous forts erected by Alfonso I. for its defence, took the name of *Castella*, was formed into a kingdom by Sancho el Mayor, who was likewise king of Navarre.

In 1137 Catalonia was annexed to Aragon by the marriage of Petronila, daughter of Ramiro II., with Raymond V., count of Barcelona. The crowns of Castile and Leon were also united at times on the same head, either by marriage or by conquest. But it was not until the end of the 11th century, that these states began to extend their frontiers at the expense of the Mohammedans. The conquests of the kings of Castile and Aragon however were gradually extended, and by the beginning of the 13th century, the Spanish Moslems were driven to the mountains of Granada, where, in 1248, Mohammed Ibnu-l-ahmar founded a new kingdom. [MOORS.] After this several unsuccessful attempts were made by the Africans to re-establish the rule of Islám in Spain.

By the marriage of Ferdinand the Catholic (1469), and the death of John II., Ferdinand's father (1479), the kingdoms of Aragon and Sicily were annexed to the crown of Castile. During that reign the important city of Alhama, one of the bulwarks of the Moorish kingdom, was reduced; Loja, Velez, Malaga, Baza, and other strong places surrendered between 1483 and 1492; and the capital itself fell into the hands of Ferdinand after a protracted defence. [GRANADA; MOORS.] The conquest of Granada was followed by the expulsion or rather the pillage of the Jews, who had engrossed nearly all the wealth and commerce of Spain. The next important event was the discovery of a new world by Columbus. [COLUMBUS.] During this reign the French were deprived of all their power in Italy. The establishment of the Inquisition in 1480, the compulsory baptism of the Moriscos, and the conquest of Navarre, which in 1512 was finally annexed to Spain, are among the important events of this reign. On the death of Isabella (1506), the crown of Castile devolved on her daughter Joanna, wife of Philip, archduke of Austria, and, on the death of the latter, upon his son Charles V., afterwards Emperor of Germany.

III. *The House of Austria* (1518–1700).—Soon after his accession to the throne of Spain, Charles V. became one of the candidates for the vacant Imperial crown, and although Francis I. of France proved a dangerous competitor, he was chosen by the Diet in 1519. [CHARLES V.; FRANCIS I.]

Philip II., who succeeded to the crown on the abdication of Charles V., in 1556, had neither the inclination nor the talents for war of his father. Accordingly his first step upon his accession was to negociate a peace with France, through the mediation of his wife Mary of England. This however was of short duration. Henry II., having been induced to re-assert the rights of France to the sovereignty of Naples, sent the Duke of Guise into Italy at the head of a powerful army; but the French were soon expelled from the Neapolitan territory. In 1557 the united forces of Spain and England, commanded by the Duke of Savoy, gained the battle of St. Quentin. The accession of Elizabeth to the throne of England changed the state of affairs. Philip's return from England to Spain, after the death of Queen Mary, was followed by a most sanguinary persecution, by which he succeeded in crushing the germ of the Reformation in the Peninsula. The Moriscos now revolted in several provinces of the kingdom; and, after a long-protracted contest, were reduced to submission, or compelled to seek refuge in Africa (1571). The Inquisition was armed with new and extraordinary power, and the flames of the *autos de fé* blazed in every corner of the Peninsula: that institution was extended by Philip to his Italian dominions. The attempt to establish the Inquisition in the Netherlands first provoked a spirit of insurrection in that country (1566), which ended in the separation of those provinces from the Spanish monarchy (1648). The death of the adventurous Don Sebastian, who fell in the battle with the Moors of Africa near Alcaçarquivir, united Portugal to Spain in 1580. The remainder of Philip's life was passed in unsuccessful designs for subjugating France and England.

Under Philip III., who reigned from 1598 to 1621, the decline of the Spanish monarchy began. His indolence led him to entrust the management of affairs entirely to his favourite the Duke of Lerma. A peace with England was concluded in 1604, and an armistice with the Netherlands in 1609, and Spain once more traded freely with her colonies; but the benefits attending on these two measures were more than counterbalanced by the total expulsion of the Moors, which deprived Spain of a considerable part of her population, in whose hands the greater part of the wealth and trade were concentrated (1610).

Philip IV. was only sixteen years of age when he ascended the throne. He entrusted the management of affairs to his favourite Gaspar de Guzman, count-duke of Olivares, who was unfit to govern a monarchy like Spain. In 1640 Portugal, by a successful insurrection, placed John of Braganza on the throne. The war with the Netherlands was renewed, and Philip was at last obliged to recognise the independence of the Provinces by the peace of Westphalia in 1648. The war in which France had taken part against Spain and Austria, still continued for eleven years more, until the peace of the Pyrenees (Nov. 7, 1659), by which Roussillon and Perpignan were finally ceded to France, and the marriage of Louis XIV. with a princess of Spain was concerted. Philip died in 1665, after appointing his widow queen-regent during the minority of his son Charles II., who was only three years old. Charles II. reigned from 1665 to 1700, during which time Spain was reduced to the most miserable condition at home by bad administration, and abroad by the reverses sustained by her arms. Three successive wars with France ended only in the treaties of Aix-la-Chapelle (1668), Nimeguen (1679), and Ryswick (1697), all of which were extremely humiliating to Spain.

As Charles had no issue, numerous intrigues were formed to prevail on him to name his successor among the various claimants of the crown. The French party prevailed, and Charles appointed Philippe d'Anjou his successor. This led to the War of the Succession, which lasted thirteen years, until Philip, having defeated the allies at Almansa in 1707, became undisturbed master of the Peninsula.

IV. *House of Bourbon* (1700–1850).—The peace of Utrecht stripped Spain of her European dominions. Belgium, Naples, Sicily, and Milan were given to Austria; Sardinia to Savoy; Minorca and Gibraltar to England. Philip died in 1746, and was succeeded by his son Ferdinand.

Ferdinand VI. adopted a neutral policy between the British and French, and this was at first pursued by his brother Charles III., king of the Two Sicilies, who succeeded him in 1759; and under the administration of men like Olavide, Campomanes, and Florida Blanca, Spain was once more respected and feared. Reform was carried by them even into the church: the power of the In-

quisition was restricted; and the Jesuits, by the Pragmatic Sanction of April 2, 1767, were banished from all the Spanish dominions, and their property was confiscated. Unluckily for Spain, the Bourbon family-compact involved her in the war between Great Britain and France (1779–83). Under Charles IV., Godoy, the queen's favourite, having succeeded Count Aranda in the administration, Spain entered on a new career of ruin and misfortune. On March 4, 1793, the French convention declared war against Spain; and though the Spanish and Portuguese forces were at first successful, Godoy in 1794 was obliged to conclude the discreditable peace of Basel, by which half of St. Domingo was resigned to France. The next step of Godoy was to conclude with the Republic a treaty of alliance offensive and defensive. But when war was declared against England, Spain had again reason to repent. Her fleet under Don José de Cordova was defeated and dispersed by Jervis. Sir Ralph Abercromby attacked and took the island of Trinidad (Feb. 1797); and Minorca surrendered to General Stuart (Nov. 1797). Portugal having refused to comply with Bonaparte's demands to admit French and Spanish garrisons into her sea-ports and fortresses until peace with England should be concluded, the invasion of that kingdom took place, and Portugal, seeing her northern provinces also threatened by the French, consented to cede Olivenza to the Spaniards, and to shut her ports against England (1801). By the peace of Amiens, which ensued (March 27, 1801), England restored to Spain all her conquests except the island of Trinidad.

In the war between England and France in 1803, Spain did not join at first; but did in that of 1805. The battle of Trafalgar inflicted upon her navy a blow from which it has never recovered. In 1807 the secret treaty of Fontainebleau was concluded between France and Spain, by which Charles surrendered to Napoleon his infant grandson's kingdom of Etruria, on condition that he should receive for him the two provinces of Entre Minho e Douro and Tras os Montes, under the name of the kingdom of Northern Lusitania. The more important provinces of Alemtejo and Algarve were to constitute a principality for Godoy, who was the principal negotiator of this treaty. Then followed the invasion of Portugal under General Junot, and the intrigues of Godoy against the Prince of the Asturias, who was tried for a conspiracy against his father's life, but unanimously acquitted by the Junta in November, 1807. In the meantime French troops had entered Spain as allies, but the people of Madrid flocked to Aranjuez, where the court was then residing, and, having attacked the house of Godoy, plundered it of its valuable contents, and set it on fire. The favourite could only escape the popular fury by hiding himself in one of the cellars of his palace. On Nov. 20, Charles, wearied with the struggles of the last few days, publicly abdicated, and declared the Prince of Asturias king of Spain. The Prince however was soon obliged to yield to the menaces of France, and the result was that Spain and the Indies were formally ceded to Bonaparte in the following May, Murat being nominated lieutenant-general of the kingdom. In the meantime the French had so exasperated the Spaniards that the feelings of the nation were roused against them. May 2, 1808, will ever be memorable for the sanguinary conflict between the unarmed inhabitants of Madrid and 25,000 well-appointed soldiers, and for the slaughter which Murat caused to be made of the inhabitants. No sooner were the events in the capital made known in the provinces than the people took up arms against the invaders. About the same time an insurrection broke out in Portugal, and the alliance of Great Britain with the Spanish nation was proclaimed. Sir Arthur Wellesley, having been sent from England to the assistance of the Spaniards, landed at Coruña Aug. 20, and having subsequently defeated the French under Junot at Vimeira, Portugal was evacuated by the convention of Cintra. Soon after the outbreak of Madrid, several Juntas had started up, simultaneously and without concert, in the provinces, to repel foreign aggression. At first a sense of common danger made them act in union; but when the intrusive king and his foreign troops had been driven almost to the foot of the Pyrenees, jealousy and intrigues took place, and the necessity of some central executive power began to be felt. Accordingly a Central Junta was installed at Aranjuez Sept. 26, and the Count of Florida Blanca was chosen president. Its first measure was a solemn proclamation of Ferdinand VII., the eldest son of Charles.

On Nov. 8 Bonaparte himself entered Spain, and the influence of his superior military talent was immediately apparent. The events of the next three or four years are well known. The Battle of Coruña was fought Jan. 16, 1809. [Moore, Sir John.] The taking of Ciudad Rodrigo and Badajoz, and the victory of Salamanca, obliged the French to abandon Madrid. Lord Wellington, after having occupied Madrid, followed the enemy to Burgos, and after several engagements transferred his head-quarters to Fresneda, on the frontier of Portugal. Thus ended the campaign of 1812. Meanwhile the Central Junta had convoked the Cortes of the kingdom, and these deputies, assembled at Cadiz, were occupied in framing a constitution for Spain, which was signed March 20, by the regents. At length Bonaparte's disasters in Russia decided the fate of the Peninsula. The battle of Vittoria and the taking of San Sebastian destroyed the remaining hopes of the French; and shortly afterwards Suchet was compelled to evacuate Catalonia. Thus ended, after six years of continual struggle, one of the most sanguinary wars on record. No sooner however was Ferdinand re-established on the throne than he commenced a series of unpopular measures. [Ferdinand VII.]

Ferdinand, by his last wife, Maria Christina, daughter of the King of the Two Sicilies, had two daughters. By the ancient laws of Spain, females could inherit the crown in default of male issue; but the Salic law of France had been introduced with the princes of the house of Bourbon. In 1789 Charles IV. had abrogated the restriction. In 1812 however the Cortes re-

established the Salic law; and, as Ferdinand had no male children, his brother Don Carlos was heir presumptive.

In 1830 Ferdinand issued a decree placing the right of succession on the same footing as before; but in 1833 the approaching death of Ferdinand seemed to threaten a change in the Spanish succession. On Sept. 17 his life was despaired of. Ferdinand's ministers, eager to secure the favour of Don Carlos, surrounded the death-bed of the king, and made him sign a decree by which he restored the operation of the Salic law. Ferdinand however unexpectedly recovered, when he immediately dismissed his minister Calomarde, called Zea Bermudez to the ministry, and annulled the act wrung from him in the agonies of anticipated death. The universities were reopened, and a general amnesty for all past political offences proclaimed. The death of Ferdinand Sept. 29, 1833, was the signal for a general rising of the adherents of Don Carlos, in opposition to Queen Isabella, who succeeded Ferdinand. The insurrection broke out in the northern provinces, and soon spread to Catalonia and other provinces.

The campaign of 1835 proved unfavourable to the queen's cause, and the aspect of affairs grew daily worse, when the death of Zumalacarregui, the Carliest leader, who was killed before Bilbao (June 25, 1835), turned the scale in favour of the queen. Vigorous measures were now adopted by Mendizabal the new minister; 100,000 men were raised in Spain, and were further assisted by the British auxiliary legion, under General de Lacy Evans, in Biscay. In Catalonia and Lower Aragon however the Carlist chief Cabrera had the advantage. In 1836 the Cortes terminated their debates on the constitution of 1812, which the government had submitted to their revision, and on June 18, 1837, the new constitution was publicly sworn to by the queen-regent.

In 1839 the cause of Carlos began visibly to lose ground; but it was not until Sept. 1840, that the Peninsula was completely pacified by the breaking up of Cabrera's army in Valencia and the taking of Morella by Espartero. After the close of the war came more domestic dissensions. The Moderado party gained power, and passed several unpopular laws. An insurrection followed, and then the voluntary abdication of the queen-regent, Nov. 1840. Espartero was now proclaimed regent, and continued to exercise that office until Nov. 8, 1843, when the young queen was declared of age, and assumed the reins of government. The queen married Oct. 10. 1846, Don Francisco d'Assiz, duke of Cadiz; and on the same day the marriage of the queen's sister, the Infanta Maria Louisa, with the Duc de Montpensier, son of Louis Philippe, then king of the French, was also solemnised.

Language.—Strabo (lib. iii. p. 139, Casaub.) says that various dialects were in use in his time among the inhabitants of the Peninsula, and that the Turditani had a written code of laws in verse. The Phœnicians and Greeks who settled in Spain must also have introduced their own languages, whilst the Celts, who occupied the north-western districts, spoke their own tongue. During the long period of Roman domination, all these languages seem to have made room for the Latin, except in the north and west of the Peninsula, where the Basque [BASQUE LANGUAGE] was always, and is still, generally spoken. The northern nations who invaded Spain in the fifth century of our æra adopted the Latin, which they corrupted by making the nouns indeclinable, as in their own rude dialects, and increasing the use of prepositions. They nevertheless introduced several words relating principally to their warlike habits, such as *hielmo* (helmet), *rico* (rich), *harpa* (harp), *jardin* (garden), *daga* (dagger), *bosque* (forest), *guantes* (gloves), *guarda* (guard), *guerra* (war), *garras* (claws), &c. Then came the Arabs, whose language was very generally spoken in the Peninsula. Nearly two centuries after the taking of Toledo by Alfonso VI., Arabic was still spoken there in preference to the Castilian, and most legal writings, even between Christian parties, were made in Arabic. Up to the end of the 13th century, the kings of Aragon were in the habit of signing their names with the letters of the Arabic alphabet. On the taking of Sevilla by Ferdinand III., it was deemed necessary to translate the Gospels into Arabic, in order to instruct the Christian population of that city in the duties of religion, which, as well as their native language, they had completely forgotten during their long captivity.

Of these heterogeneous elements the modern Spanish language is formed, although it would be difficult to say at what time it began to assume its present shape. The earliest document written in *Romance* or Castilian language hitherto discovered bears the date of 1173.

About the beginning of the 13th century, three principal languages were spoken in the Peninsula. The Castilian prevailed exclusively in the two Castiles and Leon; the Catalonian, a dialect resembling the Provençal or Limosin of the south of France, was spoken in Catalonia, Aragon, part of Valencia, and the Balearic Isles; and, lastly, the Cantabrian or Basque still maintained its ground along the western side of the Pyrenees. [BASQUE PROVINCES.] About the same time the Portuguese, which originated in a mixture of the Galician dialect and the language spoken by the French knights who served under Henry of Besançon, became more distinct from the Castilian.

The Castilian language has derived a great number of words from the Arabic. Most words beginning with *al*, and many with *j*, *x*, and *z*, are Arabic. During the reigns of Ferdinand and Charles V., Castilian became the common language of the Peninsula. The Spanish language abounds in full-sounding words, which render it suitable for poetry. The strong guttural sign *j* was introduced by the German courtiers of Charles V., for before that time *j* was pronounced soft as the Italian *g* in *gioia*, *frigido*, *giuoco*. The only guttural borrowed from the Arabs is the *h* at the beginning of a word, such as *haca*, *harapo*. The best Spanish and English Dictionary is that of Seoane, London, 1832, 8vo.

Literature.—The *Romances* or popular ballads

of Spain first demand our attention. As their name implies, they must have been coeval with or subsequent to the formation of the *Romance* or Castilian language. After these ballads the rhymed chronicle of the Cid ('Poema del Cid Campeador') is the oldest monument of Spanish literature hitherto discovered. It is written in a kind of rude Alexandrine, and bears evident traces of being posterior to most of the ballads which record the exploits of that warrior, and of being made up out of them. The supposed author of this poem lived about the end of the 12th century. Nearly to the same age belongs a fabulous chronicle of Alexander ('Poema de Alexandro Magno'), written in the same metre. Castilian poetry received a great impulse from the encouragement as well as the labours of Alfonso X., surnamed 'El Sabio' (the learned), who, besides 'El Libro de las Querellas' (the book of complaints), which has been lost, wrote a short poem, entitled 'Las Cantigas de Nuestra Señora.' Alfonso, who was the first king of Castile who ordered all public documents to be written in the *Romance*, or popular language of the time, caused translations of the Bible, and of the work of William of Tyre on the Holy Land, to be made into Castilian. He was the author or editor of a general history of Spain, 'Cronica General de España.' The history of Spanish poetry continues barren of names until the middle of the 14th century, when the example of Alfonso XI. of Castile, and of his relative Don Juan Manuel, the celebrated author of 'El Conde Lucanor,' a book of moral and political maxims, operated powerfully on the Castilian nobility. It was not until the age of John II. (1407–54) that a spirit of improvement was discernible in the ancient national poetry of Spain. Among the noblemen who composed the 'poetical court' of John II., Don Enrique, Marquis de Villena, was one of the most distinguished by his classical learning and his talents. Besides a translation of the 'Æneid' in verse, which has been lost, he wrote a mythological and moral work, entitled 'Los Trabajos de Hercules' (the labours of Hercules), which was printed for the first time at Zamora, in 1483, fol. His pupil, the Marquis de Santillana, naturalised the Italian sonnet in Castile; and his epistle to Don Pedro, constable of Portugal, on the origin of Castilian poetry, is invaluable. His 'Doctrinal de Privados,' the earliest didactic poem in the Spanish language, consists of a series of moral reflections occasioned by the unfortunate fate of Don Alvaro de Luna, the favourite of John II.

Of the state of Spanish poetry under Ferdinand and Isabella, a notion may be formed from the perusal of the 'Cancionero General,' where fifty Castilian noblemen figure as authors. Don Jorge Manrique wrote his beautiful moral couplets ('Coplas de Don Jorge Manrique,' Sev., 1494), which have been admirably translated into English, by Professor Longfellow of Boston, in the United States ('Voices of the Night,' Cambridge, 1841). Traces of the origin of Spanish dramatic poetry are first visible in this reign. During the 15th century the Spaniards possessed their religious dramas and their farces, like the rest of

Europe. In 1414 the Marquis de Villena composed an allegorical drama ('Comedia Alegorica') which was performed at the court of Aragon at the coronation of Ferdinand. In the reign of Ferdinand and Isabella considerable progress was made in historical writing. Alonzo de Palencia; Bernaldez, whose valuable chronicle is still unpublished; Pedro Martyr de Angheria, or Anghiera, the author of the 'Opus Epistolarum,' Alcalá, 1530; Antonio de Valera, who, besides his chronicle of 'Ferdinand and Isabella' (still unpublished), wrote a general history of Spain (Saragossa, 1492), which was reprinted five times before 1500; Lucio Marinéo Siculo ('Obras Historicas,' Alcalá, 1530); Antonius Nebrissensis, or de Nebrija (Granada, 1550), who was also the author of a Latin and Spanish Dictionary (Sev., 1506), and several grammatical and philological works; and lastly Pulgar ('Reyes Catolicos,' Vallad., 1565) flourished under this reign. The conquest of Granada (1492) gave a new turn to the ballad poetry of Spain. It became the fashion among the Spanish romance writers to select from the events of Moorish history materials for their songs. Such is the origin of the 'Romances Moriscos,' or Moorish ballads, with which the Spanish Romanceros are filled, and which have erroneously been considered as the work of converted Moors, or as translations from Arabic songs.

Hitherto Spanish literature had developed itself without losing any of its ancient forms, and a true national spirit prevailed in all the works; but the Italian wars having brought the Spaniards into contact with Italy, a change was effected in the national taste. The introduction of the style and forms of Italian poetry was chiefly due to Juan Boscan Almogávar, who, by imitating the classical models of antiquity, and incorporating into Castilian poetry the excellencies of the Italian poets, gave a new direction to the literary taste of his countrymen. He was assisted by his friend Garcilaso de la Vega, whose beautiful eclogues, in the style of the 'Arcadia' of Sannazaro, are still unequalled, and of which an excellent English translation in verse has appeared, by Mr. Wiffen (Lond., 1823). The next Spanish poet who followed in the path of Boscan was Don Diego Hurtado de Mendoza, the minister of Charles V., well known for his classical learning, his fine collection of Greek MSS., and for his labours in almost every branch of literature. Saa de Miranda and Jorge de Montemayor, both natives of Portugal, though they wrote chiefly in Spanish, followed the example of Boscan. The latter was the author of a pastoral romance entitled 'Diana,' which was soon translated into almost every European language. Pedro Padilla was another successful writer of pastoral poetry ('Eglogas Pastoriles,' Sev., 1582), into which he introduced the Italian and ancient Spanish metres. Fray Luis de Leon imitated the classics, and principally Horace, more successfully than any of his predecessors; and his metrical versions of the Psalms and part of the Book of Job are inimitable. But the introduction of the Italian style met with violent opposition from those who asserted that

the old Castilian metres and forms of rhyme were alone suited to the Spanish language.

The attempts of the Spaniards to imitate the romantic epic of the Italians failed; nor were they more successful in the serious epic. Even the 'Araucana' of Ercilla, 'Las Navas de Tolosa,' by Christoval de Mesa, and 'El Bernardo,' by Balbuena, are far beneath the 'Gerusalemme Liberata' of Tasso or 'As Lusiadas' of Camoens. But dramatic poetry during this period, and principally during the first half of the 17th century, made great progress. Torres Naharro, Lope de Rueda, Cervantes, and especially Lope de Vega, contributed to improve the Spanish drama. In fertility of invention, Lope de Vega is unparalleled: according to his own statement, he required no more than twenty-four hours to write a versified drama of three acts, interspersed with sonnets, tercets, and octaves, and abounding in interesting situations. He sometimes wrote a play in three or four hours. This astonishing facility enabled him to supply the Spanish theatre with upwards of two thousand original dramas, all in verse, of which only about four hundred have been printed. Calderon followed, and the Spanish theatre became the inexhaustible source whence the best French dramatists drew the subjects of their plays. Until the latter end of the 18th century the plays of Lope de Vega, Calderon, and the writers of their respective schools, were universally acted throughout Spain. Even now some of the best are still brought on the Spanish stage, though they have been recast or modernised.

About this time (1615-35) a new, irregular, and fantastical style was introduced into Spanish poetry, and the Italian school of the Marinists began to exercise an influence on the Spanish poets. Manoel de Faria e Sousa, a Portuguese by birth, was one of the first to adopt in his writings that turgidity and affectation which marked the Italian school. Luis de Gongora carried this bombastic and forced style to the highest pitch; and he soon found a host of admirers, who were called *Gongoristas*, from the name of their leader, but who gave themselves the more honourable appellation of '*cultoristas*' (or writers in cultivated style), in opposition to the simple but irregular effusions of the national school, at the head of which was Lope de Vega. This innovation however was not without opponents: the two brothers Argensola, Manuel de Villegas, Jauregui, Espinel, and others, whilst censuring the style of their antagonists, upheld the national school; and Quevedo assailed them most bitterly in his 'Culta Latiniparla.' But Gongora's admirers were not easily defeated. A new school, called the *Conceptistas*, in imitation of the Italian term *Concettisti*, applied to the followers of Marino, started up, who, without the vigorous mind and superior talents of that poet, carried to excess the empty pomp and verbose obscurity of his artificial language. The cultivation of prose style during the above period did not keep pace with poetry. The imitation of the ancient classics was considered the only means of improving the prose style. The learned theologian Fernan Perez de Oliva was the author of a dialogue on the dignity of man ('Dialogo de la Dignidad del Hombre,' Madrid, 1772, 4to.) written in the manner of Cicero, which is perhaps the best fragment of didactic prose in Spanish literature. He was followed by his pupil and nephew the learned Ambrosio Morales, historiographer to Philip II., whose works on the history and antiquities of the Peninsula are greatly esteemed. Diego de Mendoza wrote his admirable history of the war of Granada ('Guerras de Granada,' Lisboa, 1627, 4to.), in which he imitated Sallust. Mariana, Solis, and Melo, who wrote the history of the wars of Catalonia ('Historia de los Movimientos y Separacion de Cataluña,' Lisboa, 1645, 4to.), are considered by the Spaniards as models of prose style.

After imitating for some time the Italian novelists, the Spaniards invented a kind of novel, which, by way of distinguishing it from the pastoral romances in prose, and the numerous romances of chivalry, received the name of Novelas del Gusto Picaresco (or novels in the roguish style). The 'Lazarillo de Tormes,' by Diego de Mendoza, which appeared for the first time at Antwerp in 1553, and was speedily translated into French, Italian, and English; 'Gusman de Alfarache,' by Mateo Aleman; 'El Escudero Marcos Obregon,' by Espinel; 'La Picara Justina,' by Ubeda; 'La Garduña de Sevilla,' by Salas Barbadillo (Madrid, 1642); 'El Bachiller Trapaza,' by Castillo Solorzano, are fair specimens of this style of writing, which is peculiar to Spain. Nor can we pass over the 'Novelas Exemplares' of the inimitable Cervantes, whose 'Don Quixote' is, independently of its other merits, the best written work in the Spanish language. About the end of the 17th century Gracian introduced Gongorism into Spanish prose, and the national taste was corrupted.

About the beginning of the 18th century the establishment of the house of Bourbon in Spain, and the introduction of French manners, prepared the way for a reform. At that time the literature of France began to exercise an influence over the whole of Europe, and it was natural that Spain, where Philip V. had instituted academies on the model of the French, should look up to France. Ignazio de Luzan must be regarded as the founder of this new school in Spain. Unaccustomed to the long neglected forms of Spanish poetry, the new party sought to improve it, as well as the drama, by translations of French works and imitations of the French style. Luyando undertook to introduce regular tragedy on the Spanish stage, and with this view wrote two tragedies, entitled 'Virginia' and 'Athaulfo.' Velasquez, Nasarre, and Mayans endeavoured to introduce the French style into other branches of literature. But the mass of the nation still clung to the old forms of Spanish poetry; Romances were still written and sung. Garcia de la Huerta, an academician and librarian to the king, attempted to revive the taste for ancient national literature, by publishing a collection of the best Spanish dramas ('Theatro Escogido,' Madrid, 1785), and writing a tragedy entitled 'La Raquel,' which was intended to combine the old Spanish forms with the dignity of the French tragic style, without however being subject to the rules of French dramatic art. 'In the

second half of the last century, under the rule of Charles III., Spanish literature was in some manner revived by the labours of the two academies at Madrid, but chiefly through the encouragement given by the 'Academia de la Lengua,' which distributed prizes among the best poets. Some epic essays by Vargas Ponze and the elder Moratin show that the poetic genius of the Spaniards was not altogether extinct. Don Thomas Yriarte wrote a didactic poem entitled 'La Musica.' Juan Melendez Valdez wrote some Anacreontic odes not inferior in merit to those of Villegas. Cienfuegos, Salas, Quintana, Arriaza, Santos Pelegrin, Lista, Noroña, Gorostiza, Mora, Cadalso, the author of the 'Cartas Marruecas,' and many others, distinguished themselves in the various kinds of lyric or dramatic poetry. To Moratin the younger the Spanish stage was greatly indebted, and he was the first who introduced the true comedy (Comedia de Costumbres) after Molière and the best French comic writers.

Among the present writers of Spain, Martinez de la Rosa is one of the most successful. As a comic writer he is considered equal to Moratin. He has moreover gained great reputation as the author of several tragedies, of which 'La Viuda de Padilla' and 'Edipo' are the most esteemed. An epic poem on the siege of Saragossa; a drama in prose, entitled 'La Conjuracion de Venecia' (the Conspiracy of Venice), an art of poetry in imitation of that of Boileau, a political work entitled 'El Espiritu del Siglo' (the spirit of the age), and several lyric poems, show his powers for all branches of literature. A new school of dramatic writers is now being formed in Spain, whose object seems to be to combine the French drama of the school of Victor Hugo and Dumas, with the old national style. But among the numerous poets of modern Spain there is scarcely one who can be said to cultivate prose with success, and with the exception of the satirical writings of Larra and Mesonero, of Clemencin's learned 'Commentary on Don Quixote,' of Toreno's 'History of the Peninsular War,' and a few essays printed in the 'Transactions of the Royal Academy of History,' scarcely a work of ordinary merit has been published since the beginning of this century.

Spanish Drama.—In Spain, as elsewhere, it was the church that gave birth to the modern drama. The earliest theatrical performance of which we find any mention in Spanish annals is that exhibited in 1414 at the coronation festival of Ferdinand the Good, king of Aragon. It was from the pen of the Marquis de Villena, and it seems to have belonged to the class of Moralities in vogue in the infancy of the Spanish drama.

It was near the close of the 15th century that a sort of theatre was first established in Castile. The earliest dramatic attempt in this division of the peninsula was made by Juan de la Encina, who besides numerous other poetical works, composed some small pastoral pieces, which combined the elements of the comedy, the ballet, and the vaudeville. The first performance of these pastoral comedies took place in 1492. In the beginning of the 16th century the first regular Spanish dramas were produced, though not in Spain.

Bartolome de Torres-Naharro composed some comedies in his native language, which were performed at the court of Leo X. at Rome, at the same time that the 'Mandragola' of Machiavelli and the productions of Aretino were being exhibited there. In the compositions of Torres Naharro there is invention, well-drawn character, and spirited dialogue; they have also the licentious tone of the Italian comedies of that period, and contain satires against the church such as Luther himself might have dictated. No sooner did Naharro's pieces find their way to Spain (about 1520) than they were proscribed by the Inquisition. These and other first attempts in regular dramatic composition having been suppressed, found no imitators, and were soon forgotten. Schlegel, Bouterweck, Sismondi, and almost every other foreign critic were apparently ignorant even of the names of the first dramatic writers of Spain and fix the middle of the 16th century as the period of the origin of the Spanish drama. Mr. Ticknor however in his recently-published work, 'History of the Literature of Spain,' has superseded all the previous authorities, and has furnished a full and accurate account of the early dramatists.

The founder of the truly national theatre of Spain was Lope de Rueda, of Sevilla, who quitted his trade of a goldbeater to join a company of strollers, of whom he shortly became the chief. For a number of years Lope perambulated from town to town; but his great reputation at length made him in request at court. Shortly after the death of Lope, Juan de Malara caused a versified drama of his, entitled 'Locusta,' which he had written at first in Latin, to be acted at Salamanca. Then came an actor of Toledo, named Navarro, who, Cervantes tells us, brought forth the music from behind the hanging; took the false beards from the chins of those whose parts did not require them; invented machinery, and imitated clouds, thunder, and lightning.

About 1580 were established at Madrid the two theatres de la Cruz and del Principe; and some superior minds turned their efforts to dramatic composition. Cervantes, just returned from his eventful Algerine captivity, was one of the earliest adventurers in this career. [SAAVEDRA.] Cervantes wrote at Madrid; and at the same time Juan de la Cueva produced some dramas on the stage of Sevilla. Cristobal de Virues, a Valencian poet, reduced the number of acts from four to three. Originally the usual number of acts was five or six. The scenery of the Spanish theatre had also made great progress.

Already, in the 16th century, we find in Spain the contest fully and warmly engaged between the claims of the dramatic writers to an absolute independence of the classic rules, and the critics demanding a rigid adherence to the precepts of Aristotle. Thus, while the rhetorician Pinciano was exhorting the theatrical writers to respect the unities, Juan de la Cueva undertook, in his 'Exemplar Poetico,' the defence of the dramatic liberties. In the midst of these contests, arose Lope de Vega, who is noticed in our account of the *Literature* of Spain.

In 1621, twelve years before the death of Lope de Vega, happened that of the gloomily devout Philip III., who was succeeded by a young prince addicted to pleasure, passionately fond of the theatre, and himself a reputed poet. These circumstances added force to the impulse already given by Lope de Vega, and introduced the most brilliant period of the Spanish drama. During Lope's lifetime, a multitude of writers endeavoured to tread in his steps; but all of them were merely his imitators, and fell far below him.

Near the close of Lope de Vega's dramatic reign appeared Calderon de la Barca, who was destined in some degree to dethrone him. It is in the class of *Autos Sacramentales*, or religious dramas, that the genius and spirit of Calderon are most richly and fully developed. As the religious ceremonies of Paganism had given birth to the Grecian theatre, so did those of Christianity give birth to the modern. The original principle of the dramatic spectacles, introduced or sanctioned by the Romish ecclesiastics, was that of exhibiting before the eyes of the faithful, on each of the great festivals of the church and commemoration days of the saints, a living representation of the passage of the New Testament or of legendary history to which the celebration in question referred. These performances, which, in all the rest of Europe went by the name of Mysteries, were, in Spain, called from the beginning Divine Plays (*Comedias Divinas*) and Sacramental Acts (*Autos Sacramentales*). They were performed with great pomp, not only in the public squares and in processions, but also at the great theatres of the capital. Lope de Vega wrote some hundreds of these pieces; but Calderon, in this department as in others, so far excelled both his predecessors and his contemporaries, that letters patent were granted to him conferring the exclusive privilege of furnishing the *Autos* for the use of the capital; a monopoly which he enjoyed for thirty-seven years.

In the course of Calderon's protracted career arose Moreto, who, with less of the national fire of invention and richness of fancy, distinguished himself chiefly by giving a more perfect development to the plays of character, and may be regarded as one of the models of Molière. Fray Gabriel Tellez, a monk, lived about this time, and under the assumed name of Tirso de Molina, gave to the stage a number of pieces, which were afterwards collected and published by his nephew. Fray Gabriel was the first who brought upon the stage the story of 'Don Juan and the Statue;' availing himself of the legend invented by the Franciscan monks of Sevilla to account for the disappearance of the real Don Juan de Tenorio, whom, in order to put a quiet end to his notorious excesses and impieties, the holy brethren had drawn into an ambush and slain.

During this most brilliant period of the Spanish theatre, there was a host of dramatists of the second order; but the disasters which befel the Spanish monarchy in the latter years of the reign of Philip IV., and the decree of the queen-regent soon after his death, 'that all plays do cease until the king my son shall be old enough to be entertained by them,' produced a rapid decline in the dramatic art, during which period only one author worthy of notice appeared,—Solis, the eloquent historian of the conquest of Mexico, who left several plays well worthy of the dramatic period which he survived.

With Solis may be said to have expired the Spanish theatre properly so called, the elevation of Philip V. to the throne of Spain having given prevalence to the French taste. In the course of the 18th century, it is true, some attempts to re-erect a national drama were made successively by Zamora, Luzan, Canizares, and Jovellanos; but to arrive at a work of originality we must come down to the commencement of the present century, to Moratin and Martinez de la Rosa, who are noticed at the end of our account of Spanish *Literature*.

Misled apparently by the word *Comedia*, which in Spanish has always had as comprehensive a signification as the English term *Play*, many of the most eminent continental critics, especially among the French, have alleged a total absence of tragedy in the Spanish theatre, and spoken of it as a singular and unaccountable phenomenon. This is by no means the case. Boscan, who first introduced into Spain the Italian style of versification, made a translation from one of the tragedies of Euripides, which has not been preserved; and about 1520, the learned Fernan Perez de Oliva wrote two other imitations of the Greek theatre, the 'Venganza de Agamemnon,' taken from the 'Electra' of Sophocles, and the 'Hecuba,' translated from Euripides. These tragedies, written in elegant prose, remained unknown beyond the universities; nor have we reason to suppose that they were acted even there. About 1570 however, Juan de Malara gave to the theatre of Sevilla several tragedies on scriptural subjects, as 'Absalom,' 'Saul,' &c.; and at Madrid, then recently chosen to be the capital of the kingdom, a monk named Geronimo Bermudez produced, under the name of Antonio de Silva, two tragedies founded on the remarkable history of Inez de Castro. About the same time also, at Valencia, were played various dramas, still more remarkable, composed by Cristoval de Virues and by Andres Rey de Artieda. Virues opposed the classic rules, in which he was followed by Juan de la Cueva, who, after imitating the 'Ajax' of Sophocles, brought out at Sevilla two original tragedies; one, 'Las Siete Infantes de Lara,' founded on a popular tradition; the other taken from Roman history, and combining two tragic subjects, the death of Virginia and that of Appius Claudius. Meanwhile, at the Madrid theatre, the tragedies of the friar Bermudez were succeeded by those of Lupercio de Argensola, to which Cervantes gives high praise.

It is plain how much the romantic spirit predominates over the classical, even in these productions professedly tragic of the old Spanish stage. When however, the accession of Philip V. had brought the Spanish theatre within the influence of Parisian taste, not only were the French tragic poets translated into the language of Spain, but some attempts were also made by the Spanish poets to imitate them. Of this

number were the 'Virginia' and the 'Ataulfo' of Montjano. Subsequently, under the ministry of the Marquis d'Aranda, this endeavour was resumed by Fernandez de Moratin, Cadalso, and Garcia de la Huerta. At the commencement of the present century, the like effort was made with better success by Don Nicasio Alvarez de Cienfuegos, who produced 'Idomeneo,' 'Pitaco,' and 'Zoraida.' Quintana and Martinez de la Rosa have also produced excellent tragedies.

SPALATRO. [DALMATIA.]

SPALDING. [LINCOLNSHIRE.]

SPALDING, JOHANN JOACHIM, was born Nov. 1, 1714, at Triebsees, in Swedish Pomerania. He studied at the universities of Rostock and Griefswalde. In 1745 he was appointed secretary to the Swedish embassy at Berlin; but he remained in this post only for two years, as he preferred the office of preacher at Lassahn, in Swedish Pomerania. In 1757 he was made præpositus and first preacher at Barth. Owing to the reputation which he gained as an author and an orator, he was in 1764 appointed first pastor and provost to the Nicolaikirche at Berlin, where some time afterwards he was also elected a member of the chief consistory. In 1788, when the king Frederic William II., instigated by Wöllner and others of the mystic and pietistic party, issued an edict (Religions-Edict) condemning all freedom of thought in religious matters, Spalding, who belonged to the opposite party, was in some degree obliged to resign his offices. This firm adherence to his principles raised Spalding still higher in public estimation: he spent the last years of his life in retirement. He died in March, 1804.

The works of Spalding are very numerous: they are written in German, partly on philosophical and ethical subjects, and partly on theology. The principal are:—'On the Destiny of Man;' 'On the Usefulness of the Office of Preacher;' 'Religion a Concern of Man.'

SPALDING, GEORG LUDWIG, son of the preceding, was born in 1762, at Barth. He was educated at one of the gymnasia of Berlin, under Büsching. From 1779 to 1781 he studied philology and theology at the universities of Göttingen and Halle; and in order to improve his knowledge, he undertook a journey through Germany, Switzerland, France, England, and Holland. He afterwards abandoned the study of theology and devoted himself to philology. The last nineteen years of his life were employed on an edition of Quintilian; but the work was not finished at the time of his death in 1811. The first three volumes were published at Leipzig in 1798, 1803, and 1808. The remaining two volumes were edited by Buttmann and Zumpt, 1816 and 1829.

SPALLANZA'NI, LA'ZARO, was born at Scandiano, a small town near Reggio, in the duchy of Modena, on Jan. 12, 1729. His early education was directed by his father, J. N. Spallanzani, who had considerable reputation as a lawyer; and when he had reached the age of fifteen, he was sent to the Jesuits' College at Reggio, where he remained during several years. He then repaired to the university of Bologna; and while there his studies were directed by his kinswoman the celebrated Laura Bassi. He had early imbibed a fondness for the natural sciences; but his family insisted on his embracing his father's profession, and he had completed the studies necessary for obtaining the degree of doctor of laws before he could obtain permission to abandon a pursuit which was extremely distasteful to him. Immediately on quitting the profession of the law he embraced the ecclesiastical habit, and diligently applied himself to the study of languages. In the year 1754 he was chosen to fill the vacant chair of logic, metaphysics, and Greek literature in the university of Reggio.

During his stay at Reggio Spallanzani's name had become known in many parts of Europe; and he received invitations from the universities of Coimbra, Parma, and Cesena, all of which he declined from his desire not to be separated from his family. In 1761 however he accepted a professorship at Modena, which was only a few miles distant from his native town, and from this time dates the commencement of the high reputation which he acquired by his investigations into different branches of natural science. In 1766 he published a sketch of a work on the reproduction of animals; and though during his subsequent life he completed only a part of the researches which he had planned, yet his labours are most valuable.

His treatise on the circulation of the blood led to his being invited to become natural history professor at Pavia; and on entering on his new duties, to which those of director of the museum were soon added, he entirely gave up literary pursuits. His efforts were chiefly directed to elucidating the subject of the circulation of the blood, and the functions of respiration, digestion, and generation. The number and ingenuity of his experiments are not more striking than his close and logical reasoning. Besides his larger works, Spallanzani contributed numerous papers on natural history to the Transactions of various learned societies. Nor did he rest content with that knowledge only which could be acquired by books, or which the museum of Pavia or the surrounding country might afford, but he undertook journeys to different parts of Europe.

During one of his absences the envy of some of his colleagues at Pavia had been at work, defaming his character and accusing him of having stolen various specimens from the museum. Spallanzani heard of this while at Vienna, from which place he sent an answer to the charges against him. His defence overwhelmed his enemies with shame, and the return of Spallanzani to Pavia was a sort of triumphal entry; the students met their professor outside the walls, and conducted him with acclamations to his own house.

The comfort of his declining age was interrupted by severe bodily suffering, and after having experienced frequent attacks of apoplexy, he died from the effects of a fresh seizure, Feb. 12, 1799, aged 70 years.

A catalogue of Spallanzani's numerous works, many of which have been translated into English, is given at the end of his Life, in vol. vii. of the 'Biographie Médicale.'

SPANDAU. [BRANDENBURG.]

SPANHEIM, EZECHIEL, son of Friedrich Spanheim, a theologian of some note, was born at Geneva, on the 7th of December, 1629. When he was thirteen years old his father was appointed professor of theology in the university of Leyden, whither he removed with his family. Ezechiel here devoted himself first to the study of antiquity, and afterwards to that of theology, and attracted the attention of D. Heinsius and Salmasius, who guided him in his studies. He also studied the Oriental languages, especially Hebrew and Arabic. After his father's death Spanheim returned to Geneva, where he accepted the chair of eloquence in 1651; but he never gave any lectures. Being appointed tutor to the son of the elector-palatine, Ludwig Albrecht, he discharged his duties to the satisfaction of the elector, and devoted his leisure to the study of the ancients and of German law. He also translated into French the 'Cæsars' of Julian, illustrated by coins. In 1659 he visited Italy, where his principal business was a mission from the elector-palatine to the princes and states of Italy; but during his leisure he chiefly studied numismatics. On his return to Heidelberg in 1665 he was employed by the elector in diplomatic affairs, and among other missions he was sent to England, to the court of Charles II. During his residence in England he undertook also the management of the affairs of the Elector of Brandenburg, to whose service he afterwards exclusively devoted himself. In 1680 the Elector of Brandenburg sent him as his ambassador-extraordinary at the court of Louis XIV., which post he held for nearly nine years. In 1702 the Elector of Brandenburg, who had assumed the title of king, sent him as ambassador to England, where he remained till his death in November, 1710. Among his chief works are his 'Dissertationes de Præstantiâ et Usu Numismatum Antiquorum,' 4to., Rome, 1664; his 'Orbis Romanus,' of which the best edition is that of London, 1704; and commentaries on Callimachus, Strabo, and other ancient writers. Spanheim was a man of unwearied industry and of great learning.

SPANIEL, a well-known variety of the dog, and most probably of ancient Spanish origin. In former times the spaniel was taught to assist the falconer, and is still valuable to the sportsman who follows the pheasant, woodcock, or snipe. The large breed now called the *Setter*, was once of more esteem than at present, having been superseded by the *Pointer*.

The spaniel has branched out into different breeds varying in size and other qualifications. Thus we may enumerate the Cocker or Cocking Spaniel, the large Water-Spaniel, the small Water-Spaniel, the large rough Water-Dog, the King Charles's Spaniel, the Blenheim Spaniel, and others.

SPANISH TOWN. [JAMAICA.]

SPAR, a word from the German *Spath*, employed, combined with specific terms, in mineralogy, to include a great number of crystallised earthy and some metallic substances, but chiefly the former. Thus calcareous spar is crystallised carbonate of lime; fluor-spar, fluoride of calcium; heavy spar, sulphate of barytes, &c. By miners the term is frequently used alone, to express any bright crystalline substance; but in mineralogy, strictly speaking, it is never so employed.

SPARGA'NIUM, a genus of plants which with the genus *Typha* constitute the natural order *Typhaceæ*. The species are monœcious. They are found commonly in ditches and marshes of the northern hemisphere. Three of these are common in Great Britain. The *Sparganium ramosum*, Branched Bur-Reed; the *S. simplex*, Unbranched Bur-Reed; and the *S. natans*, Floating Bur-Reed.

SPA'RIDÆ, or SPAROI'DES, a family of fishes termed Breams, belonging to the section *Acanthopterygii*, which are distinguished by the following characters combined, viz. the possession of a single dorsal fin, the anterior half of which is supported by spinous rays, and which is not divided, nor is it protected by scales; the operculum is spinous, the palate destitute of teeth, the branchiostegous membrane has five or six rays, and the pyloric appendages are few in number. The body is usually of an ovate form, and covered with large scales. The mouth is not protractile.

The species of this family feed chiefly upon the animals of small shells, crustacea, &c., for crushing which their strong teeth are admirably adapted.

Guided by the structure of the teeth, Cuvier divides the family into four tribes. In the first the jaws are provided with teeth, which are rounded like paving-stones; in the second the teeth are conical and pointed; in the third the teeth are minute and thickly crowded; and the fourth tribe have a series of trenchant teeth.

Mr. Yarrell enumerates seven species as British, belonging respectively to the genera *Chrysophris*, *Pagrus*, *Pagellus*, *Dentex*, *Cantharus*, and *Brama*. ('British Fishes,' vol. i.)

SPARRMANN, ANDREW, was born in the province of Upland in Sweden, about 1747. He displayed an early fondness for the study of natural history, which was increased by a voyage which he made to China in 1765.

On his return to Sweden he repaired to the university of Upsal, and applied himself to the study of medicine, but more especially of botany, in which science he had the advantage of the instruction of Linnæus. Under the auspices of that distinguished man, he published his 'Amœnitates Academicæ,' which gave ample proof that his voyage to China had not been made in vain. He left Gottenburg, Jan. 10, 1772, in order to become tutor to the children of M. Kerste, then resident at False Bay, near the Cape of Good Hope. He reached the Cape, April 30, and remained until Captain Cook touched there with the ships Resolution and Adventure. He was then engaged as assistant to Messrs. Forster, the naturalists to the expedition, and having with them sailed round the world, he returned to Africa, in March, 1775, after an absence of twenty-eight months.

During his voyage he translated a Swedish medical work into English, for which he obtained sixty ducats, and with that money and the fruits of a four months' practice in medicine at Cape

Town, he started for the interior, July 25, 1775. He penetrated as far as the banks of the Great Fish River; and afterwards taking a direct northerly course he advanced as far as 28° 30′ S. lat., 350 leagues from the Cape. On February 6, 1776, he turned southward, and occasionally varying a little from his former track, reached Cape Town April 15, laden with specimens of plants and animals.

In the course of the same year he returned to Sweden, and found that the degree of doctor of medicine had been conferred upon him during his absence. He was next elected a member of the Academy of Sciences at Stockholm; and soon afterwards appointed conservator of the museum. His love of enterprise tempted him from his retreat to join Wadstroem's projected expedition to the interior of Africa; but on its failure he returned from Senegal, and continued at Stockholm till his death, July 20, 1820.

Sparrmann's reputation is founded chiefly on the narrative of his travels, which has been translated into English and other European languages.

SPARRMANNIA, the name of a genus of plants belonging to the natural order *Tiliaceæ*. There is only one species, the *Sparmannia Africana*, which is a native of the Cape of Good Hope. It is a beautiful shrub, much cultivated, flowering in the beginning of the spring.

SPARROW, *Fringilla domestica*, Linn.; *Prygita domestica*, Cuv.

This well-known bird, the constant attendant on civilised man wherever it is found, is the *Moineau* and *Passereau* of the French, *Passara* of the Italians, *Haus-Sperling* of the Germans, and *Sparrow* and *House-Sparrow* of the British.

Belon makes it the Στρουθὸς (*Struthus*) of the Greeks and *Passer* of the Romans, but it is by no means clear that this was the species meant.

Geographical Distribution.—Denmark, Norway, Sweden, in which last country it is more numerous if possible than with us, the whole of the British Islands, France, Spain, Portugal, Italy (rare) Liguria, and Dalmatia, in small numbers, and a stranger, as it were, in the midst of the numerous flocks of the Cisalpine Sparrow, according to Temminck; North America; the Levant, according to Mr. H. E. Strickland; Trebizond; the Nubian Mountains; the Deccan, according to Colonel Sykes, the Himalaya Mountains, and other parts of India.

The Sparrow is everywhere before our eyes, even in our most populous cities, and cannot need description; but a London sparrow requires to be well cleaned before the true colours of his plumage appear. If one of these begrimed soot-collectors be placed near a bright trim sparrow from a barn-door, it is difficult to conclude that the rustic and the citizen are birds of the same feather.

There are many accidental varieties.

This species must not be confounded with another British species, the Tree-Sparrow (*Pyrgita montana*, Cuvier.)

The Cisalpine Sparrow (*Pyrgita Italica*, Vieill., *Fringilla Cisalpina*, Temm., *Passero*, *Passera*. *Passero Commune*, and *Passero Fettajuolo* of the modern Italians) is much more abundant at the present day in Italy, where the common Sparrow is comparatively scarce; and there are two other European species.

SPARROW-HAWK. [FALCONIDÆ.]

SPARTA, or, as it was sometimes called, Lacedæmon, the capital of Laconia, was situated on the right or western bank of the Eurótas (the modern Iri or Vasilipótamo), about 20 miles from the sea, in 37° 4′ N. lat., and 22° 26′ E. long. It was built in a plain bounded on the east by the Eurotas, and on the south by a smaller stream running into it, now called Trypiótiko, and supposed by Colonel Leake (vol. i., p. 151) to be the ancient Knakion. Polybius (lib. v., 22) thus describes its general features: 'It is of a circular form, and though it is situated in a plain, contains within it several rising grounds and hills. On the east is the Eurotas, which during the greater part of the year is so large as not to be fordable; on the south-east, but on the other side of the Eurotas, is a range of hills, on which stands the suburb called Menelaïum. These are rough and difficult of approach, and they command the space between the town and the Eurotas, for the river runs close by the bottom of the heights, and the whole space, including the river, between them and Sparta, is not more than a stadium and a half (about 940 feet) in breadth.' These hills of the Menelaïum form a part only of a steep bank which rises on the eastern side of the Eurotas to the height of 500 or 600 feet, and is surmounted by a table-land, beyond which, again, lies an uneven country, intersected with ravines and rivers, gradually rising to Mount Parnon and the other summits of the range of mountains which bounds the view from the plain of Sparta on the east. (Leake, i. 137.) A corresponding boundary on the west is formed by the more elevated range of Mount Taygetus; hence Homer applies the term 'hollow Lacedæmon' to the plain of Sparta, and to the city itself. In most parts there is a level space between the eastern bank and the Eurotas. The only villages on the ancient site of Sparta are Magúla (Μαγούλα), and Psykhikó (Ψυχικόν). The principal modern town in the neighbourhood is Mistra, which lies about two miles to the west, on the slopes of Mount Taygetus.

The only considerable remains of Hellenic workmanship are the theatre, from which Mistra and the surrounding neighbourhood have been supplied with stone for building. The centre of the building was excavated in a hill. There are the remains of an old bridge over the Trypiótiko, constructed of large blocks of stone. The form of the city of Sparta was semicircular, and about 48 stadia or six Roman miles in circuit.

Every part of the site of ancient Sparta is covered with fragments of wrought stones; and here and there are scattered pieces of Doric columns of white marble, and other relics of ancient buildings. The materials of the Roman walls, now nearly ruined, which once surrounded the principal heights of the city, are formed of similar fragments. Of Sparta, Thucydides (i. 10) observes, that if 'it were evacuated, and only the temples and foundations of its buildings left, posterity would be very incredulous about the extent of its former power,

which was so great that it possessed two of the five divisions of Peloponnesus, and had the command of the whole country, and many allies out of the Peloponnesus. Of this however no adequate idea would be afforded by the city itself, as it was not embellished with temples and splendid edifices, nor built in contiguity, but in separate quarters.' Such was the state of Sparta about 400 B.C.; but architecture and the arts had not then reached their greatest development, nor had Sparta so entirely relaxed from the severity of its ancient manners as it did afterwards, when, with the increase of riches, public monuments also multiplied with more rapidity than in earlier ages. These monuments, it appears from Pausanias, were still remaining about A.D. 200, in a more perfect and uninjured state than those of any other Grecian city except Athens. From this fact, and the indications afforded by the present accumulations on the old site of Sparta, Colonel Leake has inferred that it would not be a more unpromising field for research than at least the second-rate cities of Greece.

The ancient topography of the city, as described by Pausanias, is in Colonel Leake's work ('Travels in the Morea'). The other chief modern authorities for the topography of Sparta are Dodwell and Sir W. Gell.

The Constitution and Government of Sparta.— This was of a very mixed nature, consisting of three or even four distinct elements; royalty, a council of elders or senate, a general assembly, and, in later times, the Ephoralty.

The kingly authority at Sparta was shared by two persons at the same time. The two kings were the successive representatives of the two royal families descended from Eurýsthenes and Procles, the twin sons of Aristodémus, under whom the conquest of Laconia was achieved. The constitutional powers of the kings were very limited. They presided over the council of elders, and though it seems probable that the kings of the older house had a casting vote (Herod., vi. 57; Thucyd., i. 20), still the vote of each counted for no more than that of a senator. Nevertheless the kings had some important prerogatives. In common with other magistrates they had the right of addressing the public assembly; they sat as judges in a court of their own. They were the commanders of the Spartan forces. When they had once crossed the borders of Laconia at the head of their forces, their authority became unlimited; but on their return home they were accountable for their conduct. In fact in some instances the kings were dethroned or punished for misconduct and mismanagement as generals. In the most ancient times the two kings had a joint command, but this led to inconvenience, and a law was passed, that in future one only of the two kings should have the command of the army on foreign service. The Spartan kings united the character both of priest and king.

The Gerusia or council of elders consisted of the two kings and members elected for life, which was however no very long tenure of office, as a man was not eligible till he was sixty. The council had the initiative of laws which were proposed to the popular assembly. They had also judicial authority in some cases.

The Ecclesia or general assembly of the Spartan citizens had the power of accepting or rejecting the measures which were proposed to it. All citizens above thirty years of age, and not under any disabilities, were members of the assembly. The functions and powers of the Spartan Ecclesia are thus described by Müller, in his 'Treatise on the Dorians' (iii.; iv. 9). The popular assembly alone had the power to 'proclaim a war, conclude a peace, and enter into an armistice for any length of time; and all negociations with foreign powers, though conducted by the kings and ephors, could be ratified by the same authority only.' And with regard to domestic affairs, the highest officers of the state, such as magistracies and priesthoods, were filled up 'by the votes of the people; cases of disputed succession to the throne were decided by them; changes in the constitution were proposed before them; and all new laws, after a previous resolution of the senate, were ratified by them.' So that the general assembly, according to the theory of the constitution, possessed the supreme political and legislative authority at Sparta, but subject to so many checks and limitations, that the government of the state is often spoken of as an aristocracy. One of these limitations was the Ephoralty, a power apparently foreign to the constitution as established by Lycurgus, and which appears in the first instance to have owed its aggrandisement to the connection established between itself and the assembly. In after-times it gradually overpowered the royal authority, and became the supporter of oligarchical principles and privileges. The Ephoralty consisted of five Ephori, or overseers, as the name imports.

The free citizens of the community were divided into two classes: one composed of the Spartans, or descendants of the Dorian conquerors of Laconia, and other individuals from time to time, but sparingly associated with them; the other, of a subject population, living not in the city, but in the country, and called Perioeci, or 'dwellers round,' who, though personally free, were denied all political privileges, the government and administration of the state being confined to the Spartans exclusively. The political and social institutions of Sparta appear to have originated in some degree from the relation of the citizens to their subjects and serfs. All the usages of Sparta were designed to keep up a military spirit, and to secure the superiority of the ruling class over a population which was in a state of political inferiority. We cannot however assume that the Spartan legislator Lycurgus created those peculiar institutions and social usages which characterised Sparta in the best days of her history. Such things are not created at once nor by the will or invention of one man. They are the growth of a long period. He may have organised and reduced to a system much that already existed, and he may have added something to it. If he so arranged the matter of property as to give an equal portion of land to each of the nine thousand citizens, as we are told, he must in this matter at

least have made a great innovation. His rules for the education and discipline of youth from their birth, which were of a very strict and formal kind, have the appearance of being the inventions of a man who thought that all the members of society should be drilled like a body of soldiers. The great object of his education was to make men fit to be soldiers, and to give them activity, endurance, and courage. Modesty, obedience, and respect to age and rank were inculcated as the duties of the young. To die for their country was a fundamental principle. After attaining eighteen the Spartan youth passed from the period of boyhood, and at twenty they served in the ranks. Exemption from military service was not granted till the age of sixty.

Another important feature of the Spartan institutions was the Syssitia, or public meals, in which all the citizens of a suitable age joined. The guests were divided into societies, or clubs, generally of fifteen men; any vacancy was filled by ballot, and unanimous consent was requisite for the admission of new members. The repast of each club was of a frugal and temperate character, but enlivened by social and cheerful conversation, and the entertainment was provided by the contributions of the individual members.

The chief strength of the Spartan forces was in the heavy-armed infantry, which was superior to that of any other state in Greece. The horsemen of Sparta, in the Peloponnesian war, were at first only 400, and afterwards rose to 600 men (Müller, iii. 12, 6), a very small force for so powerful and warlike a state. The naval service was chiefly confined to the Perioeci.

The Spartan institutions incidentally served other important ends, such as the invigoration and health of the body, and the production of physical beauty. (Müller, iv. 5, 8.) That these results were produced by them appears from the fact that the Spartans were at one time the most healthy of the Greeks (Xenop., 'Rep. Lacon.,' v. 9), and that the handsomest men and women were found amongst them. But the systematic training which we have described was not coupled with excellence in the arts and sciences. Nor indeed could it be expected that Sparta should produce among her citizens the painter, the sculptor, the poet, or the historian. They were all warriors; and therefore the cultivation of the arts and sciences, and even of agriculture, was left almost entirely to the Perioeci and the Helots.

The women were in many respects brought up like the men. They had their own gymnasia, and practised themselves in running, wrestling, and other exercises, which contributed to their health and vigour of constitution, that they might prove the mothers of a healthy progeny.

The Spartan national character, as exhibited in its greatest purity, was distinguished by a love of fixedness and an aversion to change; by simplicity and sobriety of taste; by steadiness and composure under exciting circumstances; and a patriotism in which all selfish and personal considerations were forgotten. Other elements of this character were, a calm and steady courage, perseverance in the pursuit of desired ends, a strict regard and

ready submission to the laws, a comparative indifference to personal independence and individual freedom, a constant striving after uniformity and unity, and a strong attachment to the usages and manners of their ancestors, and to existing institutions. Hence it has been said that the Spartans were better as members of a state than as members of a society; and as they were accustomed to follow implicitly national custom without consulting the dictates of their own conscience, whenever this guide failed they wandered wholly and entirely from the path of rectitude.

The exclusiveness and independence to which the Spartans were naturally inclined, were increased by their geographical position, which, with the exception of the Arcadians, was more retired and isolated than that of any other people in Peloponnesus. It produced however a stiffness and haughtiness in their dealings with foreigners, which, as contrasted with the more conciliating and courteous manners of the Athenians, excited a disgust which was the main cause of their losing their supremacy over the confederated forces of Greece at the close of the Persian war. Connected with this exclusiveness was the reserve which formed so striking a point in the Spartan character, and the concise and sententious mode of expression, which sometimes served as a cloak for the concealment of real opinions and intentions. To such an extent was this carried, that the Lacedæmonians, after the Persian war, appear to have gained an unenviable character for artfulness and duplicity in their dealings with strangers. It would be easy to prove this from various passages of Aristóphanes, in one of which ('Acharn.,' v. 308) they are said to have regard neither for altars nor pledges nor oaths; and also from Euripides, who in one place ('Androm.,' 452) calls them 'deceitful flatterers, masters of lies.' But we have more unexceptionable testimony to this point in the historians Heródotus and Thucýdides, the former of whom (ix. 54) describes the Lacedæmonians as being in the habit of saying one thing and meaning another; while the latter (v. 105) affirms, or rather makes the Athenians affirm of them, that as far as respects themselves and their native institutions they were virtuous and well principled; but that in their dealings with foreign states they undisguisedly made expediency and their own interest their only rule of action. We must however remember that the character of the Spartans suffered much in its better qualities from their intercourse with foreigners after the close of the Persian war, and that in the later times of Spartan history the institutions of Lycurgus had lost much of their power over and their adaptation to the minds of the people.

History of Sparta.—The occupation of Laconia by the Spartans dates, according to the received chronology, from the year 1104 B.C., the 80th after the Trojan war; but some writers place that event in B.C. 1048. The Dorians migrated from Doris, a district lying between the chains of Mount Œta on the north and Parnassus on the south, and under the command of three leaders, Aristodémus, Témenus, and Cresphontes, reputed descendants of Hercules, invaded the Peloponn-

nesus; they were accompanied and guided in their expedition by Oxylus, an Ætolian chief, and soon succeeded in making themselves masters of the country. In the division which took place, Laconia was assigned to Aristodémus, Argos to Témenus, Messenia to Cresphontes, and Elis was given to Oxylus as a reward for his assistance. According to the historian Éphorus, quoted by Strabo, the subjugation of Laconia was effected in a very short time. Eurýsthenes and Procles, the twin sons and heirs of Aristodémus, divided Laconia into six districts. During the sovereignty of the twin brothers, the Achæans, the old inhabitants, enjoyed the same political privileges as their conquerors; but the next king, Agis, reduced them to a state of vassalage or dependence on the Spartans. The story adds that all the Achæans submitted at once, with the exception of the inhabitants of Helos, a town on the sea-coast, who endeavoured to shake off the yoke, but failing in their revolt, lost both their political independence and personal freedom, and were afterwards distinguished, they and their posterity, by the name of Helots. Till the conquest of Laconia was effected, the Spartans were probably too much occupied at home to engage in foreign wars. Their earliest expeditions were into Arcadia and Argos. Against Tégea the capital of the former country, they continued to wage war, and always unsuccessfully, for many generations. The prosecution of this war however was interrupted by the prospect of a more important and tempting conquest, that of Messenia. The first of the Messenian wars commenced about B.C. 743, and terminated in the defeat and subjection of Messenia. The struggle was renewed in B.C. 685, and ended in a like result B.C. 668. From B.C. 668, the close of the second Messenian war, Sparta had a course of uninterrupted success until she became supreme in the Peloponnesus. The invasion of Attica at the instigation of the Delphian oracle, under their king Cleómenes, for the purpose of expelling Hippias, the son of Pisístratus, took them out of the Peloponnesus, and brought them into closer contact with the states of Northern Greece. Hippias was expelled B.C. 510. The subsequent history of Sparta is closely connected with that of Athens, and is treated in the general histories of Greece.

From the battle of Mantineia, B.C. 362, Sparta was no longer one of the leading powers in Greece; and a new power appeared in the north, the kingdom of Macedonia. After the battle of Chæronea (B.C. 338), king Philip of Macedonia invaded Laconia, and, according to Polybius (ix., 28), obliged her to surrender several small districts to the Argives, Arcadians, and Messenians. In the reign of Alexander, and while he was engaged in his Eastern conquests, the Spartans made an attempt to overthrow the Macedonian Empire, but they were defeated by Antipater, Alexander's lieutenant, and Agis their king and commander was slain, B.C. 331. In the contests which divided Greece after the death of Alexander, Demetrius, the son of Antigonus, defeated the Spartans in two engagements. Their next assailant was Pyrrhus (B.C. 268), against whom they made a gallant defence, assisted and animated by the women, whose spirit saved the city from capture. At that time it was walled. After that event we hear little of Sparta till the reigns of Agis III. and Cleomenes (B.C. 240). The institutions of Lycurgus, though existing in name, were no longer of any force at Sparta. The regulation by which every head of a family was ensured the possession of a plot of land had been repealed. The number of Spartan citizens was considerably reduced, and a great accumulation of property was vested in the hands of a few people, many of whom were females. Agis and his friends wished to return to the original constitution, and the mode of life of former times. He perished in the attempt to carry out his views (B.C. 240), being murdered in prison at the instigation of the ephors, who had now monopolised almost all authority. In B.C. 236, Cleomenes III. ascended the throne, and by stratagem and force succeeded in the attempt in which Agis had failed; a general division and re-distribution of property took place; some of the Perioeci were adopted amongst the Spartan citizens; the old mode of education and the public meals were resumed; and the ephors were put to death. Cleomenes also defeated the troops of the Achæan league in several engagements, and had conquered a great part of the Peloponnesus, when Arátus, the stratégus or general of the Achæans, summoned Antigonus Doson from Macedonia to oppose his progress. The Macedonians and Spartans met at Sellasia, on the borders of Laconia, and after a hard-fought and decisive battle Antigonus was victorious. He then marched to Sparta, and restored the former state of things. Cleomenes fled to Egypt.

Pausanias (iii. 6, 5) observes of him, that he was the last of the Agidæ, and shortly afterwards the sovereignty was sold by the ephors to Lycurgus, who was not even a Heraclid. He was succeeded by Machánidas, who was defeated and slain by Philopœmen, the general of the Achæans. Nabis, the last of these Spartan kings or usurpers, opposed the Achæans and the Romans, who had now appeared in Greece. Nabis was assassinated B.C. 192, and the Spartans were soon after compelled to join the Achæan league. After the capture of Corinth B.C. 146, Sparta with the rest of Greece came under the dominion of the Romans. Sparta founded few colonies. The principal were the island Calliste or Thera, now Santorin, Cnidus, and Tarentum.

SPARTI'NA, a genus of grasses belonging to the tribe *Chlorideæ*. There are two British species, the *S. stricta* and *S. alterniflora*. The former grows in muddy salt-marshes; the latter has been found only on the mud-flats of the river Itchen at Southampton.

SPARTUM, a name applied by the Romans to the plant much used by them for cordage. It is fully described by Pliny ('Nat. Hist.,' xix. 2), who says that it had not been noticed by Theophrastus, and that it is an herb growing of itself without setting or sowing, and that it might be called the rush of a dry and lean ground; that it is common about Carthago Nova (Carthagena), and that whole mountains are overspread with it.

When pulled, which is done with some difficulty, it is made into bundles, afterwards dried, and then steeped in water, a process which is repeated two or three times; no cordage exposed to wet was considered better than that of this plant.

SPASM (from the Greek σπασμὸς) is an unhealthy, involuntary, and forcible contraction of muscular tissue. The term is almost synonymous with *Convulsion*, but is more generally applied than that word is to the unhealthy painful contractions of the heart, intestines, and other involuntary muscles.

The greater number of spasms seem to depend on an irritation of the nervous centres. Sometimes they are produced by primary disease in those parts, but much more commonly they are the results of irritation propagated from some disordered organ to the brain or spinal chord, and thence reflected through the motor nerves of the muscles in which the spasm occurs. For the means of removing spasm, see ANTISPASMODICS.

SPATHE (the Greek σπάθη). This term is applied to the sheathing involucrum of many plants. It is seen in the greatest perfection in the flowers of *Palmaceæ* and *Araceæ*, where, during the flowering of the plants, it embraces the entire inflorescence. This organ is considered by most botanists to be a modification of the bract, and as the plants in the above orders have no corolla, it probably performs the function of the ordinary floral envelopes. Link considers the spathe a modification of the petiole. The flowers of the Narcissus, the Snowdrop, and the Iris, are invested, in the early periods of their growth, with a spathe which only encloses a single flower.

SPATHO'DEA, a genus of plants belonging to the natural order *Bignoniaceæ*. The species are erect shrubs or trees, rarely climbing shrubs. The flowers somewhat panicled, orange-coloured, yellow, or purple. *S. Roxburghii* is a native of the Circars, in Hindustan. The branches are very spreading. The bark gray, with a few scabrous spots. The flowers large, rose-coloured, and delightfully fragrant. *S. longiflora* is an arboreous plant, the wood of which is high-coloured, hard, durable, and much used amongst the inhabitants of the hills about the coasts of Coromandel and Malabar, where it is plentiful.

SPATULA'RIA, a genus of fishes of the Sturgeon tribe, remarkable for the form of their snouts, which are enormously prolonged and leaf-like in form. The Paddle-Fish of the Mississippi is the type.

SPAWN is a term frequently used in gardening to indicate the buds or branches which are produced from underground stems. These, from the facility with which they form roots when separated from the parent stem, are capable of maintaining an independent existence, and on this account are employed as a means of propagating many plants.

Spawn is also applied to the white fibrous matter which, shooting through earth, dung, decaying vegetable matter, &c., is the matrix from which mushrooms and other fungi are produced. It is generally composed of small white thready fibres, which produce, at various distances, little white knobs, from which the stem and cap of the mushroom proceed. This matrix or spawn, called Mycelium, is in fact the real stem of the mushroom, and the Stipes and Pileus, with their appendages, are the inflorescence. This spawn is made use of for the purpose of procuring from it the growth of the edible mushroom (*Agaricus campestris*). [MUSHROOM.]

SPEAKING TRUMPET. Instruments for enabling the human voice to be heard at a great distance appear to have been known to the ancient Chinese, and such are referred to in a French work published by Renaudot in 1718, entitled 'Anciennes Relations des Indes et de la Chine, de deux Voyageurs Mahometans, qui y allèrent dans le Neuvième Siècle.' Also, in a manuscript preserved in the Vatican, entitled 'Secretum Secretorum,' which is erroneously ascribed to Aristotle, it is stated that Alexander assembled his army by means of a 'great horn;' but that either this or the Chinese instrument was used to transmit articulate sounds, is very doubtful.

The modern speaking-trumpet appears to have been an invention of Sir Samuel Morland who, in a pamphlet entitled 'Tuba Stentoro-Phonica,' describes the instrument as having been invented and experimented upon in the year 1670. This first trumpet was of glass, 2 feet 8 inches long, and he afterwards made one of copper, recurved in the form of a common trumpet. Its total length was 16 feet 8 inches, the large end 19 inches, and the small end 2 inches in diameter. With this the voice was heard about a mile and a half. Morland made another of the same form, still larger, and two others of the straight form, and 5 feet and a half long. With the latter a man could make himself heard a mile and a half; and with one of the largest trumpets, tried at Deal Castle, the voice was conducted a distance of between two and three miles over the sea.

In 1673 Athanasius Kircher, in the preface to his 'Phonurgia,' claimed the invention of the speaking-trumpet for himself, and intimated that he had published a description of one several years before the appearance of Morland's pamphlet. His claim does not however appear to be very well supported, since, according to Beckmann, the 'Ars Magna Lucis et Umbræ' of Kircher, which seems to have been first published about 1643, contains only an account of Alexander's horn, and of a tube, of which one end was to be applied to the mouth of the speaker, and the other to the ear of the listener. His 'Musurgia,' printed in 1650, affords little more evidence in his favour, being only a description of a kind of funnel by which the voice of persons near the large end might be conducted to the small end. The efficiency of the speaking-trumpet is generally ascribed to the repeated reflection of the sound from side to side in passing through it, and its ultimate reflection from the mouth of the trumpet, in such a way as either to collect the rays of sound into a focus at a distance, or to project them forward in parallel lines, instead of allowing them to diverge in all directions. But Professor (Sir John) Leslie, in his 'Experimental Inquiry into the Nature and Propagation of Heat,' accounts for its effect in the

following manner:—'The tube, by its length and narrowness, detains the efflux of air, and has the same effect as if it diminished the volubility of that fluid, or increased its density.' 'The organs of articulation,' he continues, 'strike with concentrated force; and the pulses, thus vigorously excited, are from the reflected form of the aperture, finally enabled to escape, and to spread themselves along the atmosphere.' The effect of a speaking-trumpet is the same, whether the metal tube be used simply, or wrapped round in such a way as to prevent vibration. It is also heard at the same distance when the inner surface is lined with linen or woollen cloth to diminish reflection; and the range of a cylindrical trumpet is the same as that of a conical one.

SPECIALTY, SPECIALTY DEBT, or debt by special contract, is a debt which becomes due or is acknowledged to be due by an instrument under seal. [DEED.]

Blackstone (ii. 464) considers a debt of record, that is, a debt which appears to be due by the judgment of a court of record, as a 'contract of the highest nature, being established by the sentence of a court of judicature.' This is however an erroneous view of the matter. It is simply a rule of law that a debt, for which the judgment of a court of record has been obtained, has a priority over other debts.

SPECIES. All the individual forms of plants, as well as animals, that occur on the globe, may be collected into groups resembling each other, and these groups are called *Species*. A species has been defined to be 'a combination of individuals alike in all their parts;' 'a systematic combination of homogeneous individuals;' 'a collection of individuals which will breed together and produce fertile offspring.' De Candolle says that a species is 'a collection of all the individuals which resemble each other more than they resemble anything else; which can by mutual fecundation produce fertile individuals; and which reproduce themselves, by generation, in such a manner that we may from analogy suppose them all sprung from one single individual.

As a general rule Species are not distinguished by differences in the internal organisation, such differences being left for the higher divisions into *Genera, Orders,* and *Classes;* but upon those superficial and external differences which are independent of internal structure.

Those departures from identity of structure, which are considered insufficient to constitute a species, are called *Varieties,* and the points of structure that should constitute a species or variety is frequently a matter of difference of opinion, and it is no unfrequent thing for one author to reduce the species of another to mere varieties.

SPECIES. This word is used in mathematics, or rather has been used, in two different senses. In the first place, by Euclid, who means by figures of the same species those which have the same form, whatever may be their size. Thus, in the Data, when the form of a figure is given, he designates it *as* given in species.

But the term was again used by Vieta in its logical sense, as opposed to individual, in designating the algebraical notation which he first distinctly proposed. Vieta borrowed the word to signify the use of letters to stand for numbers, when such letters were used to designate members generally, without reference to any one in particular. The logistics (a common term for the science of calculation) thus introduced he called *specious.*

SPECIFIC GRAVITY, or more properly Specific Weight, is a term used to express the weight of any gas, liquid, or solid, under some given volume, as a cubic foot, a cubic inch, &c. Distilled water is the substance usually employed for the purpose of comparing together the weights of all substances except the gases; and because the volume of any substance varies with its temperature, in determining from experiment the specific gravity of any substance, the weight under a given volume is reduced to that which it would become at one constant temperature.

In the Parliamentary Regulations, which were made in 1825, a cubic inch of water is stated to weigh 252.458 troy grains, the temperature being 62° Fahrenheit, and the height of the barometrical column, 30 inches; and 7000 troy grains are made equivalent to one pound avoirdupois: hence it follows that a cubic foot of water should weigh 997.136 ounces. This number is sufficiently near 1000 to make it very proper that it should be adopted for the specific gravity of water, since a change in the value of the avoirdupois ounce, which would be scarcely appreciable in the ordinary transactions of commerce, would render the ounce an accurate and convenient unit of weight, while the cubic foot constitutes the unit of volume.

On the Continent, since the employment of the decimal scale of weights and measures has become general, the cubic centimetre (.061028 cubic inches English) is the unit of volume, and the gramme (15.407 troy grains) is the unit of weight; the gramme having been determined by the weight of a cubic centimetre of distilled water of the temperature at which its density is a maximum (38.25° Fahr.).

The hydrostatical balance which is employed in determining the specific gravities of bodies is constructed similarly to an ordinary balance, but with as much delicacy as possible; and a particular contrivance is adopted in order to ascertain the weight of any substance within, for example, one-hundredth part of a grain. Thus, from the lower part of the scale containing the substance to be weighed, there is suspended a brass wire, whose volume and weight have been previously determined, and part of its length enters into water which is contained in a vessel underneath the scale. The scales with this wire thus attached to one of them being previously put in equilibrio when the surface of the water is at a certain mark on the wire, the substance to be weighed is introduced into the scale above the wire, and weights are placed in the opposite scale till one grain more would be found too great: then gently raising the whole balance till, by the increase of the weight on the side of the scale containing the substance, in consequence of a greater portion of the wire

being out of the water, an equilibrium takes place. The wire being graduated so that 100 divisions correspond to a weight equal to one grain, the number of graduations on it between the surface of the water and the fixed mark before mentioned will enable the experimenter to determine the number of hundredths of a grain by which the weight of the substance in the scale exceeds the number of grains already placed in the opposite scale.

If it be required to weigh a substance in water, or in any other liquid, that substance may be suspended in a vessel containing the liquid by a horse-hair attached below the scale opposite to that from whence the wire before mentioned was suspended; and its weight while immersed in the liquid may be found to the hundredth part of a grain, as in the former case.

A solid body having greater specific gravity than water being thus weighed both in air and water, may have its specific gravity determined, that of the water being supposed to be known or assumed, by the following proportion:

The weight lost by immersion in water, that is, the weight of water equal in volume to the volume of the solid,
Is to the weight of the body in air,
As the specific gravity of the water is to that of the body.

The specific gravity of a fluid is found by weighing any one and the same solid body in air, in water, and also in the fluid, and observing the two differences of weight. These differences are the weights of quantities of the two fluids which are equal in volume to the solid body; and they are to one another as the specific gravities of the two fluids: hence that specific gravity which was required may be found. It should be observed that the specific gravity of the solid must be greater than that of either of the fluids, in order that the solid may sink when immersed in them.

If the body whose specific gravity is to be found be a solid lighter than water, there must be annexed to it, before it is weighed, a mass of some material of known specific gravity, and such that the two bodies may sink together in water. Then, the difference between the weight of water equal in volume to the compound body, and the weight of water equal in volume to the heavier body, is the weight of water equal in volume to the lighter body; and hence the specific gravity of the lighter body may be found.

When the body is soluble in water, its specific gravity may be found as before on substituting for water a fluid whose specific gravity is known, and which is not capable of dissolving the body.

If the solid body imbibe water without being dissolved in it, it must be weighed when dry, and there must also be found the weight of water displaced by the body when dry: the difference between these is the weight of water displaced by the solid part only of the body. Then this difference is to the weight, when dry, as the specific gravity of water is to the specific gravity of the solid part of the body.

The weight of a body in vacuo is evidently greater than the weight in air, by the weight of a volume of air equal to the difference between the volume of the body and that of the object by which the weight is determined.

To find the specific gravity of atmospherical air, a glass vessel of known volume, from which the air has been extracted as much as possible by an air-pump, is weighed: afterwards, by opening a valve, the atmospherical air is allowed to fill the vessel; and in this state the vessel is again weighed. The difference between the weights is the weight of a volume of air equal to the interior capacity of the vessel; and from this the specific gravity of the air may be determined. In like manner having weighed the vessel after the atmospherical air has been removed from it by the air-pump, let the vessel be filled with any gas whose specific gravity is to be determined, and, in this state, let it be again weighed. The difference between these weights will be the weight of the gas. In deducing the results from these experiments, corrections must always be made for the variations in the density and temperature of the atmosphere, and for the quantity of aqueous vapour which it contains; for the changes in the volume of the vessel on account of the changes of temperature; and, lastly, for the small quantity of atmospherical air which remains in the vessel after the exhaustion has been carried as far as the air-pump will permit. For the formulæ by which *the corrections should be made see Biot's 'Traité* de Physique.'

Tables of Specific Gravities.

Gases.

Barometer 30 in. Fahrenheit's thermometer 60°. The specific gravity of atmospherical air is represented by unity.

Hydrogen	0.0694	Thomson.
	0.074	Davy, Sir H.
Ammoniacal gas	0.5902	Thomson.
Aqueous vapour	0.625	Gay-Lussac.
Do. (in contact with water at 212° Fahr.)	0.484	Dalton.
Nitrogen	0.9691	Biot and Arago.
Atmospherical air	1.	
Oxygen	1.1111	Thomson.
Muriatic acid gas	1.2847	Do.
Carbonic acid gas	1.5196	Biot and Arago.
Nitrous oxide gas (laughing gas)	1.5277	Thomson.
	1.614	Davy, Sir H.
Chlorine	2.5082	Do.
Iodine, vapour of	8.678	Gay-Lussac.

The following tables are compiled from the works of Muschenbroek, Haüy, Kirwan, Lavoisier, Biot and Arago, Drs. Thomson, Young, and Ure; from the 'Philosophical Transactions,' and from other authentic sources. The table for the different kinds of wood is from the experiments of Muschenbroek, and from those of Mr. Couch of Plymouth, as quoted by Mr. P. Barlow.

Liquids.

Barometer 30 in. Fahrenheit's thermometer 60°. The specific gravity of water is represented by 1000.

Naphtha	708
Æther, muriatic	730
Do., nitric	909
Alcohol, pure	796

Water, at 212° Fahr. (distilled)	956.2
Do., at 60° do.	1000
Do., at 35° (maximum of density)	1000.9
Sea-water	1026
Cyder	1018
Beer, pale	1023
Do., brown	1034
Wine, Burgundy	992
Do., Port	997
Do., Madeira	1038
Oil of turpentine (essential)	870
Whale oil	923
Muriatic acid	1194
Nitric acid	1217
Sulphuric acid (pure)	1848.5
Do., do. (highly concentrated)	2125

Gums, Animal Substances, &c.

Specific gravity of water	1000.
Indigo	769
Fat, beef	923
Butter	942
Spermaceti	943
Lard	948
Bees-wax, yellow	965
Bees-wax, white	969
Camphor	989
Urine	1011
Blood, human (serum)	1028
Milk, woman's	1020.3
Do., cow's	1032.4
Do., ewe's	1040.9
Copal, from Madagascar	1060
Mastic	1074
Gum, euphorbia	1124
Gum, ammoniac	1207
Gamboge	1222
Guiacum	1229
Gum from Aleppo	1235
Gum, tragacanth	1316
Assafœtida	1328
Opium	1336
Aloes, hepatic	1359
Myrrh	1360
Aloes, Socotrine	1380
Honey	1450
Gum, arabic	1452
White sugar	1606
Ivory	1826

Woods.

Specific gravity of water	1000.
Cork	240
Poplar, common	383
White Pine, from New Brunswick (mean)	402
Do., from the United States (do.)	426
Yellow Pine, from Canada (do.)	440
Riga Fir, an inferior kind (do.)	479
Sassafras	482
Spruce Fir, from Canada	518
Poplar, White Spanish	529
Larch, from Scotland	530
Red Pine, from Canada	536
Willow	585
Elm, English	588 to 800
Riga Fir, superior kind (mean)	598
Lime or Linden-tree	604

Cedar, from Palestine	613
Pitch Pine, from Baltimore (mean)	632
Mahogany	637 to 1063
Yellow Wood, from the Cape of Good Hope	643
Teak	666
Walnut-tree	671
Elder	695
Fir, from Scotland	696
Oak, English	743 to 760
Beech	852
Box, French	912
Olive	927
Logwood	931
Heart of Oak, 60 years old	1170
Ebony	1177
Vine	1327
Box, Dutch	1328
Lignum Vitæ	1333

Earths, Stones, &c.

Specific gravity of water	1000.
Pumice-stone	915
Ambergris	780 to 926
Gunpowder (closely shaken)	932
Amber, yellow (transparent)	1078
Bitumen from Judæa	1104
Cannel coal	1270
Slate coal (English)	1250 to 1370
Phosphorus	1714
Nitre	1900
Brick	2000
Sulphur (native)	2033
Opal (precious)	2114
Stone (silicious, for grinding)	2143
Gypsum (opaque)	2168
Gypsum (transparent)	2274
Stalactite (transparent)	2324
Obsidian	2348
Jasper (green)	2359
Porcelain (china)	2385
Stone (paving)	2416 to 2460
Stalactite (opaque)	2478
Stone (from Portland)	2496
Spar (transparent)	2564
Asbestos (ripe)	2578
Flint (black)	2582
Agate (oriental)	2590
Carnelian (stalactite)	2591
Serpentine (veined black and olive)	2594
Flint (white)	2594
Spar (pure)	2603
Pebble (English)	2609
Calcedony (common)	2616
Carnelian (veined)	2623
Serpentine (opaque, red and black)	2627
Glass (green)	2642
Marble (French)	2649
Quartz (milky)	2652
Crystal (from Brazil)	2653
Granite (red Egyptian)	2654
Quartz (crystallised)	2655
Agate (veined)	2667
Marble (green Egyptian)	2668
Slate (common)	2672
Porphyry (green, common)	2676
Marble (from Siena)	2678
Alabaster (from Piedmont)	2693

Jasper (yellow)	2710
Marble (Carrara, white)	2717
Beryl (occidental)	2723
Alabaster (oriental, white)	2730
Glass (bottle)	2733
Marble (green, from Campania)	2742
Alabaster (oriental)	2762
Porphyry (red)	2765
Emerald (from Peru)	2775
Chalk (British)	2657 to 2784
Talc (Muscovy)	2792
Marble (white Parian)	2838
Basalt (from the Giant's Causeway)	2864
Hone (white), razor	2876
Glass (white)	2892
Armgonite	2946
Serpentine (fibrous)	3000
Lapis-lazuli	2767 to 3054
Schorl (tourmalin, from Ceylon)	3054
Asbestos (starry)	3073
Sapphire (Brazilian)	3131
Schorl (Brazilian emerald)	3156
Limestone (white fluor)	3156
Diamond (Brazilian)	3444
Do. (white oriental)	3521
Do. (rose-coloured, oriental)	3531
Ruby (Brazilian)	3531
Topaz (Brazilian)	3536
Beryl (oriental)	3549
Hornblende (common)	3600 to 3830
Hyacinth (common)	3687
Spar (adamantine)	3873
Pyrites (ferruginous, cubic)	3900
Sapphire (oriental)	3994
Hyacinth	4000 to 4620
Garnet (from Syria)	4000
Topaz (oriental)	4011
Vermilion	4230
Ruby (oriental)	4283
Barytes, Sulphate of	4481
Pyrites (coppery)	4954
Lapis Calaminaris	5000

Metals.

Specific gravity of water	1000.
Sodium	865
Potassium	972
Plumbago	1987 to 2267
Arsenic (glass of)	3594
White-lead	4059
Antimony (crude)	4064
Molybdena	4738
Manganese (striated)	4756
Loadstone	4800
Copper (from Cornwall)	5452
Tungsten	6066
Litharge	6300
Uranium	6440
Zinc (in its common state)	6862
Iron (cast at Rotherham)	7157
Zinc (compressed)	7191
Iron (cast at Carron)	7248
Tin (pure, Cornish, not hardened)	7291
Tin (do. hardened)	7299
Iron (forged into bars)	7600 to 7788
Copper (native)	7600 to 7800
Nickel (molten)	7807

Cobalt (molten)	7812
Steel (tempered and hardened)	7818
Brass (cast, common)	7824
Steel (not tempered)	7833
Mercury (precipitate, red)	8399
Brass (cast, wire-drawn)	8544
Copper (wire-drawn)	8878
Bismuth (native)	9020
Do. (molten)	9823
Silver (native, common)	10,000
Mercury (brown cinnabar)	10,218
Silver (virgin, hammered)	10,511
Lead (molten)	11,352
Mercury (fluent)	13,568
Do. (congealed)	15,630
Gold (not hammered)	15,709
Do. (hammered)	15,775
Do. (standard; 22 carats)	18,888
Do. (fine, 24 carats)	19,259
Do. (hammered)	19,362
Platinum (purified)	19,500
Do. (hammered)	20,336
Do. (wire-drawn)	21,041
Do. (compressed by being rolled)	22,069

SPECIFIC HEAT, originally designated by Dr. Black, *Capacity of Heat*, is the quantity of caloric which a substance of any kind absorbs, or which it gives out, when it undergoes a change of temperature; being determined, *in a* substance of any kind, with relation to the quantity which a substance of another kind, as water, absorbs or gives out in undergoing a like change of temperature.

If the body whose specific heat is to be determined is a solid, it is first heated to any convenient number of degrees of temperature, suppose 212° Fahr.; it is then placed in the calorimeter [HEAT], and allowed to remain there till it is reduced to the temperature of ice (32°); then the quotient arising from the weight of the water obtained from the melting of the ice surrounding the body, divided by the product of 180° (=212° −32°) multiplied by the heat of the body, will express the required specific heat. The specific heat of water or any liquid is determined by the calorimeter in a similar manner; the liquid heated to 212°, for example, being contained in a glass vessel, and care being taken to deduct from the total quantity of water produced by the melted ice that part of it which, by experiment, is found to depend on the cooling of the vessel containing the liquid.

The specific heats of solids and liquids are found to be greater at high than at low temperatures, probably on account of the dilatations which the substances experience by an increase of heat; and, from careful experiments made by MM. Dulong and Petit, the mean specific heats of different solids, that of water at 212° being unity, were found to be as in the following table:—

	(Between 32° and 212° Fahr.)	(Between 32° and 572°)
Platinum	0.0355	0.0355
Silver	0.0557	0.0611
Zinc	0.0927	0.1015
Copper	0.0949	0.1013
Iron	0.1098	0.1218

With respect to liquids, Lavoisier and La Place

have given a table of their specific heats, of which the following is an extract:—

Mercury	0.029
Sulphuric acid (spec. grav. = 1.87058)	0.334596
Nitric acid (spec. grav. = 1.29898)	0.661391
Water	1.0

The specific heat of gases are still subject to much uncertainty, though many attempts have been made by eminent philosophers to determine them. The following table contains the results of some of the experiments made by MM. Delaroche and Bérard on different gases, the weights of the quantities of gas being equal and the specific heat of water being unity:—

Carbonic acid gas	0.2210
Oxygen gas	0.2361
Atmospheric air	0.2669
Nitrogen gas	0.2754
Olefiant gas	0.4207
Aqueous vapour	0.8470
Hydrogen gas	3.2936

The specific heats of volumes of the same gas, having equal weights, are found to vary with the density and elasticity of the gas.

SPECIFICATION. [PATENT.]

SPECKTER, ERWIN, was born in 1806, at Hamburg, where his father, a native of Hanover, was settled as a merchant. An acquaintance with the painter Herterich first directed his attention towards art. In 1818 young Speckter made some attempts in portraits and in drawings to illustrate the old 'Reineke Fuchs,' and the talents which he displayed gained him the encouraging guidance of Von Rumohr in 1822. The works of Overbeck for a time enlisted Speckter among the followers of that school. Speckter's chief labours were however studies from nature of every description, and portraits: his first oil-picture was a view of the town-house of Mölln.

In 1825 he visited Munich, and placed himself under the direction of Cornelius, who allotted him one of the vaults or loggie in the corridor of the Pinacothek, which he did not live to execute. In 1827 Speckter returned to Hamburg, where he painted his picture of 'Christ and the Woman of Samaria;' but the deep impression made upon him by Overbeck's picture of 'Christ's Entry into Jerusalem' had had a very prejudicial effect upon him, through his inordinate striving after abstract ideal representation. In 1830 he appeared in an entirely new character in his arabesque and mythologic decorations of the house of the Syndicus Sieveking near Hamburg. In Sept. of this year he set out by Berlin and Munich for Italy, and arrived in Rome in Jan. 1831. Here he confined his labours almost exclusively to studies, and these are in the general spirit of Italian art, quite in a different style from his early efforts.

In the spring of 1835, though suffering greatly from asthma, Speckter undertook to paint the frescoes in the villa of Dr. Abendroth, then recently constructed by M. de Chateauneuf. The first of his designs, distinguished for the exquisite beauty of its forms, was completed, and the second was partly executed; the third was not commenced. Speckter died Nov. 23, 1835. His letters, published in 1846, under the title of 'Letters of a German Artist from Italy' ('Briefe eines Deutschen Künstlers aus Italien,' 2 vols. 12mo., Leipzig, 1846), are full of interesting matter and reflections on art.

SPECTACLES are glass lenses so mounted in frames as to be conveniently retained before the eyes in order to assist defective vision. It has been conceived, though with very little foundation, that spectacles were in use among the ancients; but most authorities give the latter part of the 13th century as the period of their invention. The mention of magnifying-glasses by Roger Bacon, who died about 1292, justifies the supposition that something like what are now called spectacles were in use at least several years earlier. Extensively as these useful instruments are employed, there can be no doubt that, were the subject more generally understood, the amount of advantage obtained from them would be greatly augmented. The eyes of an individual whose sight is much tried often receive the most serious injury from improper delay in the use of spectacles; while the sight of many persons is prematurely worn out by the use of glasses of too high a power, or too short a focal length. The use of a single reading-glass instead of spectacles is very injurious; since, by occasioning one eye to be more used than the other, the focal lengths of the two are rendered unequal. The unsteadiness of the glass is also a disadvantage.

Varieties in the conformation of the eyes, and in the manner and degree in which they are affected by use, render it impossible to lay down any rule for the focal length of convex glasses for persons of a given age; yet the following extract from a table in Dr. Kitchener's 'Economy of the Eyes' may, in many cases, prove useful. As a general rule it may be observed that, whether the glasses be concave or convex, the lowest power that is available should be used. [SIGHT.]

Years of age.	Inches of focus.
40	36
50	24
60	16
70	12
80	9
90	7

How little dependence is to be placed upon such a table may be perceived from facts recorded in the same volume, in which instances are given of very young persons who required magnifiers of six or eight inches focus, while in other cases individuals of great age required no glasses at all, or glasses of very low power. Short-sightedness being still less dependent upon age, cannot be met by any rule even so well as the opposite defect.

It is very essential that the frame of the spectacles should fit comfortably to the head, and be of such form as to bring the centre of each lens exactly opposite to the centre of the eye it is intended to serve. The endless variations met with in the width between the eyes, the total width of the head, and the form of the nose, render it frequently difficult to suit an individual out of even a very large stock. Convex spectacles, being used for viewing near objects, may generally be placed lower down upon the wearer's nose than

those used by short-sighted persons, who are compelled to hold up their heads in an awkward manner, unless the glasses rest naturally in such a position as to enable him to see distant objects with an erect position of the head. This is accomplished by having the bridge between the glasses nearly in a line joining their centres. The oval form is usually preferred for the lenses, because it allows most room for the motion of the eye in a lateral direction, without giving unnecessary weight. Much has been written respecting the various qualities of glass used in spectacles, but it may be taken as a general rule that, except in cases where it is necessary to protect the eyes from an injurious glare of light, the most colourless material is to be preferred. The accurate figure of the lenses cannot however be too strongly insisted on.

The Periscopic Spectacles of Dr. Wollaston were contrived in order to allow considerable latitude of motion to the eyes without fatigue, by conforming the shape of the glasses to that of the eyes. This is effected by the use of lenses either of a meniscus or a concavo-convex form, the concave side being in both cases turned towards the eye. Divided spectacles, each glass consisting of two half-lenses, are sometimes used, the upper half of each glass being occupied by a concave lens, or one of very slight convexity, for seeing distant objects, while the lower half has a strong magnifier, for examining things near the eye. The present Astronomer Royal finds that one of his eyes refracts the rays of light to a nearer focus in the vertical than in the horizontal plane; and this defect he has succeeded in remedying by using a double concave lens, one surface of which is spherical and the other cylindrical.

From what has been stated above it is evident that much care and judgment are required in the choice of spectacles. The specious name of *Preservers* has been given to convex glasses of 36 inches focus; and many persons have entertained an opinion that such spectacles have the property of arresting the progress of that natural change by which most individuals become long-sighted as they become older; but it is almost needless to say that such an opinion is entirely without foundation. The only spectacles to which the wearer can with propriety apply the name are those which, of whatever power they may be, are exactly suited to his particular case. Such spectacles, although they cannot stop the natural changes of the eye, may greatly diminish their inconvenience, and even retard their progress; and therefore may not unfitly be termed Preservers; but few things can be more injurious than the use of spectacles of any kind before they are actually wanted, under the fallacious idea that they will maintain the sight unimpaired, notwithstanding the organic changes which accompany increasing years.

SPECTRUM, in Optics, is a name applied to the elongated image of the sun which is formed on a screen in a darkened room when a slender beam of the sun's rays passing through a perforation in the wall or in a window-shutter has been afterwards transmitted through a prism formed of any transparent medium. [DISPERSION.] The coloured image which remains on a screen when the sun's light is suffered to pass through two prisms of different media, as crown glass and flint glass, in which case the dispersion of the red and violet rays only is destroyed, is called a Secondary Spectrum.

Prisms of three different media might be formed which would unite the rays of three different colours; the uncorrected colours would then produce a spectrum much smaller than that which remains when two differently-coloured rays only are united, and Sir John Herschel proposes to call it a Tertiary Spectrum, by using a greater number of prisms, for the purpose of uniting with the former the rays of other colours; but the diminution of light caused by the employment of so many media would become an evil greater than that which it is proposed to correct.

Fraunhofer first observed that when a beam of light from the sun, after passing through a narrow slit (about $\frac{1}{100}$ in. in breadth) in the wall or in the window-shutter of a darkened room, and then through a still narrower aperture in an opaque screen placed a few inches from the object-glass of a telescope (the two apertures being parallel to one another), was allowed to fall on the object-glass, the coloured fringes produced by the diffraction of light at the edges of the aperture, being viewed through the telescope, assumed the appearance of spectra similar to those produced by the refraction of light through a prism of some transparent medium. To these images Fraunhofer gave the name of spectra of the first class; they are composed of variously-coloured light, the tints melting into one another by insensible gradations, and they exhibit dark lines as in the usual prismatic spectra.

When there was placed before the telescope a grating consisting of many very slender wires parallel to one another and to the aperture in the wall, and having very narrow intervals between them, there appeared in the field of view a dark space on either side of the image of the aperture in the wall, and beyond this, on each side, a series of spectra each consisting of variously-coloured spaces, of homogeneous light, separated from one another by dark lines; these he called spectra of the second class.

When two linear apertures only were made in the screen at the object end of the telescope, there appeared in the field, between the image of the aperture in the wall and the first of the spectra, on each side, what Fraunhofer designated imperfect spectra of the second class; these consisted of coloured spaces similar to those in the spectra of the first class, but without the dark lines; and when three linear apertures only were formed in the screen, there appeared, between the image of the aperture and the nearest imperfect spectrum of the second class, other spectra less distinctly formed than the latter, and, like them, without the dark lines; these he denominated spectra of the third class. No other classes of spectra than those which have been mentioned were observed on increasing the number of apertures in the screen.

SPECULA'RIA, a genus of plants belonging to the natural order *Campanulaceæ*. This genus

has been separated from that of *Campanula* by recent systematists. The species are small annual plants inhabiting the regions of the Mediterranean and the temperate parts of Europe. One species, the *S. perfoliata*, is a native of North and South America. *S. hybrida* is a native of the cornfields of Great Britain, and is found commonly throughout the region of the Mediterranean. There are several other species of this genus, all of which are worth cultivating on account of their showy flowers.

SPE'CULUM, a name frequently given to a mirror used for any scientific purpose, as in a reflecting telescope. [TELESCOPE.] The following are the principal laws of reflection from spherical mirrors; their investigations may be seen in Coddington's work on 'Reflection and Refraction.'

If a pencil of rays diverge from a radiant point in the axis of a concave speculum of a spherical form, all the rays will, after reflection, converge nearly to a certain point in the same axis, at which the image of the radiant point is said to be formed. This point is called the Focus. None of the rays are, in strictness, reflected to the focus, but all those which are reflected from the mirror at points very near its intersection with the axis fall extremely near it.

The position of this focal point is determined by the equation

$$\frac{1}{w} = \frac{2}{r} - \frac{1}{u},$$

in which u is the distance of the radiant point, and w that of the focus from the mirror, both being measured along the axis, and r is the radius of curvature of the mirror.

All the rays proceeding from the radiant point pass through an imaginary circle, called the circle of least aberration, and the distance of the centre of this circle, measured on the axis, from the focus towards the mirror, is expressed by

$$\frac{3}{4}\frac{w^2}{r}\frac{Y^2}{}\left(\frac{1}{r} - \frac{1}{u}\right)^2,$$

in which Y is the length of the circular arc by whose revolution about the axis the concave surface of the mirror is supposed to be formed; and this is three-fourths of the longitudinal aberration of an extreme ray of the pencil.

The diameter of this circle of least aberration is

$$\frac{1}{2}\frac{w}{r}\frac{Y^3}{}\left(\frac{1}{r} - \frac{1}{u}\right)^2,$$

which is one-half the lateral aberration of the extreme ray.

When the rays fall parallel to each other on the mirror, u is infinite, and we have $\frac{1}{2}r$ for the value of w, $\frac{3\,Y^2}{16r}$ for the distance of the circle of least aberration from the focus, and $\frac{Y^3}{4r}$ for its diameter.

The formulæ for a convex mirror may be found by making r negative in those for a concave mirror. Hence w is always negative, or the focus of every pencil is behind the mirror: the longitudinal aberrations change sign, but not the latitudinal ones.

The image in a convex mirror is always upright; and in a concave one always inverted, except when the object falls between the principal focus (or middle point of the radius) and the mirror.

SPECULUM METAL. The best composition for the metals of reflecting telescopes is a subject which has been much investigated. About 70 different mixtures were tried by the Rev. John Edwards, the particulars of which are stated in the 'Nautical Almanac' for the year 1787; he found copper 32, tin 15, brass 1, silver 1, arsenic 1, meaning of course arsenious acid or white oxide, to form an alloy which was the whitest, hardest, most reflective, and took the highest polish.

In the 'Philosophical Transactions' for 1840, Lord Rosse, then Lord Oxmantown, published an account of a speculum 3 feet diameter which he had then executed; and from this we learn that after many trials to determine what combination of metals were most useful for the purpose, with respect to whiteness, porosity, and hardness, one of copper and tin (the materials employed by Newton in the first reflecting telescope) united in the proportion of 126.4 parts of copper to 58.9 parts of tin, was found the best. It is stated that the compound is of admirable lustre and hardness, and has a specific gravity of 8.8, that of water being 1.

Lord Rosse has subsequently cast specula 6 feet diameter, of the like composition, and each in one piece, with complete success. One of these is mounted at Parsonstown, in Ireland, in a tube 56 feet long, with which already important discoveries have been made in the heavens.

The specula were cast in moulds made by binding together layers of hoop-iron; and both the grinding and the polishing were executed by machinery which was put in motion by a small steam-engine. The speculum, when mounted, rests on a bed consisting of twenty-seven triangular pieces of iron, supported at their centres of gravity on the corners of nine other triangular pieces, which are also supported at their centres of gravity. By this contrivance any change in the form of the box or tube, by warping or otherwise, produces no effect on the speculum.

SPEED, JOHN, was born in 1542, at Farrington in Cheshire, but came early in life to London. He was brought up to the business of a tailor, and did not appear as an author before 1608. The first work which he published was a collection of maps of the English and Welsh counties, with plans of cities, and engravings of various antiquities, said to have been first published in 1608; but when formed into the work entitled 'The Theatre of the Empire of Great Britain,' it bore the date of 1611. In this work he owed much to the labours of Christopher Saxton and John Norden. The other work of Speed's is a history or chronicle of England, entitled 'The History of Great Britain under the Conquests of the Romans, Saxons, Danes, and Normans,' originally published in 1611. He was also the compiler of a set of Tables of Scripture Genealogy. He died in 1629.

SPELMAN, SIR HENRY, was born in 1562 of an ancient family at Congham in Norfolk. He was educated at Walsingham in that county; thence he removed to Trinity College, Cambridge; and at the age of eighteen was entered of Lincoln's Inn. Instead however of proceeding to the practice of the law, he devoted himself to historical and antiquarian research, and the study of ancient manuscripts and records. The earliest of his works is his treatise 'De non Temerandis Ecclesiis.' In 1626 appeared the first part, which is all that he himself published, of a most valuable glossary of terms which occur in records and other ancient historical writings. This work he entitled 'Glossarium Archaiologicum;' but it contains only as far as the letter L. The work was however completed from his manuscript after his death, partly by his son, but principally by Sir William Dugdale, under whose superintendence it was published. His other great work he left in like manner incomplete. This is his 'Concilia, Decreta, Leges, Constitutiones, in Re Ecclesiasticâ Orbis Britannici,' of which the first volume was printed in 1639, and the second in 1664. He published some minor works, and left behind him several manuscripts. He died in London in 1641, and was buried in Westminster Abbey.

His son, Sir John Spelman, inherited the taste and a portion of the learning of his father. He is the author of a 'Critical Life of King Alfred,' Oxford, fol., 1678.

SPELTER. [ZINC.]

SPENCE, JOSEPH, was born at Kingsclere, Hampshire, April 25, 1699. He was educated at Winchester School, and became fellow of New College, Oxford, in 1722. In 1728, having entered into orders, he was chosen professor of poetry, and presented to the rectory of Birchanger, in Essex. His essay on Pope's translation of 'The Odyssey,' introduced him to the notice of that poet, at whose request he published, in 1736, Sackville's tragedy of 'Gorboduc,' with a prefatory account of the author. In 1742 he was presented by his college to the rectory of Great Horwood, Bucks, and succeeded to the vacant professorship of modern history. In 1747 he published his 'Polymetis; or an Enquiry concerning the Agreement between the Works of the Roman Poets and the Remains of the Ancient Artists, being an attempt to illustrate them mutually from each other.' In 1754 he was made a prebendary of Durham cathedral.

The latter years of Spence were passed in retirement in the country. He died Aug. 20, 1768.

Spence collected an interesting volume of anecdotes, which was published by Malone, to which the biographers of Pope are much indebted for records of his conversations.

SPENCER, JOHN CHARLES SPENCER, third EARL, best remembered as Viscount Althorp, was the eldest son of George John, second Earl Spencer, and was born May 30, 1782. He was educated at Harrow; whence he was sent to Trinity College Cambridge, where he took the honorary degree of M.A. in 1802.

In April or May, 1804, Viscount Althorp entered the House of Commons as one of the members for Oakhampton. On the formation of the Whig ministry of Mr. Fox and Lord Grenville, Feb. 11, 1806, in which his father Earl Spencer took office as Secretary of State for the Home Department, Lord Althorp was appointed one of the Junior Lords of the Treasury. He of course lost his seat at the Treasury Board when the Grenville administration was dissolved in March, 1807; nor did he again hold office till the accession of Lord Grey and his friends to power in Nov. 1830. During all this interval, although he did not come forward in debate so frequently as some other members, he was regarded as one of the steadiest supporters of the Opposition in the House of Commons. He was prominent for several years in a series of economical attacks upon the Tory administration, and his house was the resort of a powerful section of the Whig party, who considered him their leader.

On the accession to power of the Grey administration in November, 1830, Lord Althorp was appointed Chancellor of the Exchequer. His position, and the universal confidence in his integrity, made him the ministerial leader in the House of Commons. No man probably had ever filled the post who possessed less of the gift of oratory; but the clearheadedness and sound sense of Lord Althorp were considered amply to make up for that deficiency. This opinion was justified by the manner in which the Reform Bill and the Poor Law Amendment Bill were carried through the House—the task in both cases falling principally upon his lordship. The death of Earl Spencer, Nov. 10, 1834, which occasioned the removal of Lord Althorp to the Upper House, led to the downfall of the ministry. When the administration of Sir Robert Peel and the Duke of Wellington, which succeeded, was obliged to resign in April following, and the Whigs came again into power under the premiership of Lord Melbourne, Earl Spencer was, as well as Lord Brougham, left out of the new cabinet. It was understood that he declined to take office again.

Earl Spencer had always been strongly attached to agricultural pursuits; and now that he was relieved from official occupation he devoted his leisure with more eagerness than ever to practical farming, the rearing of cattle, the patronage of agricultural associations, and whatever promised to advance his favourite science; while at the same time he was a decided supporter of the doctrines of free trade. Like his father he was also distinguished for his love and encouragement of literature. He was one of the original members of the Roxburghe Club (for the reprinting of rare and curious tracts), of which his father was the first President. He was also Vice-Chairman of the Council of the Society for the Diffusion of Useful Knowledge. He died at his seat of Wiseton Hall, in Nottinghamshire, Oct. 1, 1845.

SPENSER, EDMUND, was born in 1553, in East Smithfield, London. He appears to have been well connected. We find him entered as a sizar at Pembroke Hall, Cambridge, May 20, 1569. In 1572 he took the degree of A.B., and in 1576 that of A.M. He soon after quitted the university, and went to reside with some friends

in the north. During this retirement he wrote his first work, the 'Shepherd's Calendar,' and fell in love with his 'Rosalind,' who is by some supposed to have been a real personage. Sir Philip Sidney, to whom this work was dedicated, appears to have warmly patronised the poet. In 1850 the 'Foure Epistles' which passed between Spenser and Gabriel Harvey appeared. The subjects of these letters were an earthquake which happened at that time in London, and satirical poetry. Spenser is addressed under the name of 'Immerito.' In 1580 Spenser was sent to Ireland as secretary to Lord Grey of Wilton, by the Earl of Leicester, Sir Philip Sidney's uncle. His services procured him in 1586 a grant from the crown of 3028 acres of land, called Kilcolman, in the county of Cork, forfeited by the Earl of Desmond. In the same year (1586) he lost his kind friend and patron Sir Philip Sidney, a mournful event which produced 'Astrophel,' a pastoral elegy on Sir Philip. This work was not published until 1595.

During his residence at Kilcolman the 'Faerie Queen' was most probably begun. In 1590 the first three books appeared. In 1591 'Colin Clout's come home again,' was published. This poem is dedicated to Sir Walter Raleigh, who appears to have become, after Sir Philip Sidney's death, Spenser's principal friend and patron, and who is generally believed to have introduced him to Queen Elizabeth. In 1591 were also published a collection of minor poems, entitled 'Complaints,' and the second part of the 'Faerie Queen.' The six books which were wanting to complete the work are stated to have been lost in their passage from Ireland by the carelessness of Spenser's servant; but Fenton the poet denies this. Two 'Cantos of Mutability,' which were first published in the collection of 1609, appear to be all that remain to us of the missing six books.

In 1596 he published four 'Hymns,' addressed to the Countess of Cumberland and Warwick. In the same year he wrote his masterly 'View of Ireland,' published by Sir James Ware in 1633. His 'Prothalamion,' a nuptial poem, appeared about the same time.

The close of Spenser's career was lamentable. Tyrone's rebellion broke out in 1598. Ben Johnson related to Drummond of Hawthornden that 'the Irish having robbed Spenser's goods and burnt his house and a little child new born, he and his wife escaped; and after he *died for lake of bread* in King Street, and refused twenty pieces sent to him by my Lord of Essex, adding, "He was sorrie he had no time to spend them."' Spenser certainly died Jan. 16, 1598-1599, in King Street, Westminster, though let us hope, for the honour of his numerous friends, not for 'lake of bread.' He was buried, at his own request, near Chaucer, in Westminster Abbey.

SPE'RGULA, the name of a genus of plants belonging to the natural order *Caryophylleæ*. This genus is found in fields and cultivated ground, especially on sandy soils, all over the world. It is divided into two sections, one of which possesses stipules; the other is without these organs. On this ground many writers have constituted new genera. But the old name with the two sections is most generally adopted. *Spergula arvensis*, the Corn-Spurrey, or Yarr, is a native of Europe, in gardens and fields, and in North America on the banks of the Columbia, and is common in Great Britain. Though not cultivated in England, this plant is of some importance on the Continent, and in the Netherlands and Germany is sown for fodder. It is said to be well adapted for poor soils. Three other species, the *S. nodosa*, Knotted Spurrey, *S. saginoides*, Pearlwort Spurrey, and *S. subulata*, Awl-shaped Spurrey, are also natives of Great Britain, but are neither ornamental nor useful.

SPERMACETI, or *Cetaceum*, is a fatty material which is obtained from the *Physeter macrocephalus*, a species of whale, generally met with in the South Seas, but occasionally also on the coast of Greenland. The spermaceti occurs chiefly in the head. During the life of the animal the spermaceti is in a fluid state; and on the head being opened, has the appearance of an oily clear white liquid. On exposure to the air the spermaceti concretes and deposits from the oil. They are then separated, and put into different barrels. The head of a whale sixty-four feet in length has been found to yield twenty-four barrels of spermaceti, and from seventy to one hundred barrels of oil. When brought to England, the spermaceti has not a white shining silky appearance, but a yellowish colour, owing to the presence of some oil. To separate this it is filtered, pressed, and subjected to various operations. When perfectly pure, it becomes cetine. [CETINE.]

Spermaceti possesses the properties common to fatty matters. It is bland and demulcent, with considerable nutritive qualities, when taken internally. It was formerly much used in colds and coughs, united with mucilage or syrup, to shield the throat from the irritation of the air, also in dysentery. Triturated with sugar-candy, and having warm milk added to it, it is a mild nutrient article, fit for children or old persons. It is however now chiefly employed externally as an ingredient in ointments and cerates. It is also largely used in the making of candles.

SPERMACOSE, a genus of plants of the natural family of *Rubiaceæ*, so named from the seeds being terminated by two remarkable points. The species are very common and abundant in tropical parts of the world; they have usually quadrangular stems and branches, with small white or blue flowers. Some of the species, as *S. Poaya* and *S. ferruginea*, are useful, like other plants of the same family, in having roots which form substitutes for Ipecacuanha.

SPERMADICTYON, a genus of the natural order of *Rubiaceæ*. The species form shrubs with white and light blue very fragrant flowers. They are natives of India.

SPERMOE'DIA, the name given by Fries to a certain altered form of the seeds of rye and other grasses, and to which the name *Ergot* and *Spurred Grain* has been commonly applied. The bodies to which this name is given are solid elongated masses, growing from the inside of the ovary of grasses, rootless, and of a firm mealy substance, with a concrete scaly or powdery crust. The precise nature of these grains, both on account

of their peculiar medicinal effects and their poisonous qualities when taken as food, have excited much attention amongst botanical observers. Wildenow supposed the ergot to be merely a diseased state of the grain, and stated that he could produce it at pleasure by excessive watering. General Field made some observations which led him to suppose that it originated from the puncture of insects. De Candolle and others more recently determined that the ergot was a distinct parasitic plant, developing itself from the ovary of grasses, and referred it to the genus *Sclerotium*. Fries, in his 'Systema Mucologicum,' considered the ergot to be a diseased state of the grain, and placed it in the doubtful genus *Spermoedia*. More recently this production has been carefully investigated by Mr. Edwin Quekett, who communicated the results of his observations to the Linnæan Society in November, 1838. From his examinations, it appears that the great mass of the ergot consists of the albuminous matter of the grain in a diseased state. The interior of these grains had been described as being filled by flocci and sporules compacted together; but on examination with the microscope, after the outside was scraped off, the interior was found to be composed of irregular cells filled with globules of a fatty oil. The cause of this changed state of the internal parts of the grain was found on the outside of the ergotized grain, where a number of very small oval or elliptical bodies were found, about 1-6000th of an inch in diameter, and containing within them a number of smaller granules. These were found to be the sporidia and sporules of a fungoid plant, which, attached to filaments, developed themselves early in the growth of the grain, and produced its diseased state. Mr. Quekett has since succeeded in obtaining ergotized rye by applying to healthy plants of rye water containing the sporules of this fungus diffused through it; thus affording additional proof that plants become diseased by imbibing the sporules of other plants from the soil in which they grow. For the plant as above described, Mr. Quekett proposes the name *Ergotætia abortans*.

SPEUSIPPUS, the son of a sister of the philosopher Plato, was born in Attica. He was a disciple of his uncle Plato, whose general principles he adopted; but he differed from his master, as he mixed up empiricism with the idealism of Plato, and consequently attributed more importance to the senses, and also combined with his system several Pythagorean principles. He wrote also about plants and animals; but on the whole he must be regarded as the continuator of the Platonic philosophy, and as the founder of the old Academic school of philosophy. A long list of his works, of which only few fragments are preserved, is given by Diogenes Laertius (iv. 1).

SPEY, a river in Scotland, and one of the largest in Great Britain, as it runs rather more than 96 miles, and drains an area of 1300 square miles. A small lake, called Loch Spey, is its source. This lake is about 10 miles south of the southern extremity of Loch Ness. It is about 1200 feet above the sea-level, and is surrounded by the summits of the Coryaranik Mountains, a continuation of the Monadh Leadh Mountains, which traverse Scotland, between 57° and 57° 30′, in a N.E. and S.W. direction. The river issues from the eastern side of the lake and continues to run in that direction between high and naked mountains, and in a very narrow glen, for about 10 miles. It then enters, near Garvimore, a plain of moderate extent, the greater part of which is occupied by moorlands, but the lower part along the banks contains excellent pasture ground. A few miles below Laggan the river turns to the N.E., in which direction it continues to its mouth. It is joined from the south by the river Truim, which may be considered as the southern branch of the Spey. After its confluence with the Truim, the Spey flows in a fine valley, from one to two miles wide, whose surface is so little above the bed of the river, that the greater part of it is subject to frequent inundations. Several small rivers join the Spey above Rothiemurchus; but none of the valleys are wide enough to be inhabited, with the exception of that of the Fesshie, which is inhabited to the distance of about 6 miles from the banks of the Spey. The Spey, before the Fesshie joins it, flows through Loch Inch, which is about 3 miles long and a mile wide, and surrounded by fine meadows. At Aviemore Inn begins the central valley of the Spey, commonly called Strath Spey, into which the valleys of three rivers, the Nethy, Avon, and Dulnain, open. The valley of the Spey is here much wider, being between 3 and 4 miles across. The Nethy and Avon join it on the right bank, and the Dulnain on the left or west bank. The central valley of the Spey terminates near Knockando, where the river begins to run E. In its lower valley the Spey runs E. between Knockando and Abelour, and afterwards N. Its course here acquires a rapidity which entitles it to the epithet of the swiftest river in Great Britain. Above the church at Abelour it forms a waterfall 30 feet high; and the descent of the waters from the Boat of Bog to the sea, a distance of only 3 miles, is 60 feet. It is evident that the river here descends with rapidity from the elevated table-land on which its upper course lies. The valley of the Livet opens into that of the Spey below Abelour. The Spey is not navigated, but great floats of timber are sent down from the forests of Kingussie and Abernethy to Garmouth. In order to prevent the timber from being shivered in passing the numerous rapids and cataracts in the lower course of the river, several canals have been cut along the banks. The variations of the Spey, as to quantity of water, are extremely sudden.

SPEYER, or SPIRE, an ancient city in the Bavarian Palatinate, is situated in 49° 20′ N. lat., 9° 35′ E. long., on the left bank of the Rhine, 12 miles by railway S. from Mannheim, and has about 9000 inhabitants. It is surrounded with walls and ditches, and has five gates. Of the churches 15 belong to the Catholics and two to the Lutherans. The most remarkable structure in the city is the venerable cathedral founded by the emperor Conrad in 1030, and completed by Henry IV. in 1061. It was very richly adorned, and contained the remains

of eight emperors, three empresses, and two imperial princesses; but their marble sepulchres, their statues, and silver coffins were desecrated and plundered by the French in 1689. The sepulchres of Rudolph of Habsburg, Adolphus of Nassau, and Albert I. have been restored. In former times the diet of the German Empire was frequently held at Speyer. One of the most important of these diets was that of 1529, when a protest made by the Reformers against certain proceedings of the emperors procured them the name of Protestants. The city has a gymnasium, a lyceum, an hospital, an orphan-house, and a botanic garden. In the Hall of Antiquities there is a collection of Roman and ancient German remains found in the neighbouring country. The chief manufactures are snuff, sugar of lead, and wax; there are likewise some vinegar-works, and considerable cattle and corn markets.

SPEZZIA. [GENOA.]

SPHACTERIA. [NAVARINO.]

SPHÆRALCE'A, the name of a genus of plants belonging to the natural order *Malvaceæ*. The species are trees or shrubs. The flowers are of a reddish or flesh colour. With the exception of one, which is a native of the Cape of Good Hope, the species are all found in South America. They all of them bear elegant flowers, and will thrive well in gardens in this country. *S. Cisplatina*, the Cisplatine Globe-Mallow, is a native of Brazil, in the western part of the Cisplatine province. It is used medicinally in Brazil, in the same manner as marsh-mallows are in Europe. The decoction is given in inflammations of the bowels, and it is also employed as a fomentation in diseases of the chest.

SPHÆRANTHUS, a genus of plants of the natural family of *Compositæ*. The species are small herbs common in tropical parts of the Old World. *S. mollis* is common in most parts of the plains of India. It has a strong aromatic odour, and is used by the natives in medicine.

SPHÆ'RIA, the name of a genus of plants belonging to the natural order *Fungaceæ*. They are generally found upon decaying vegetable matter, and seem as if they were immersed in the substance on which they grow. Their most frequent position is on the bark of the stem and branches of decayed trees. One of the species, *Sphæria militaris*, is remarkable for growing from the dead bodies of caterpillars and other decaying animal matters. Another species, the *S. entomorhiza*, is also found in the same positions.

Like the great mass of the vast order of Fungi, the species of *Sphæria* have not been used as food or medicine, or cultivated as ornament. Their great use in the economy of nature appears to be, the appropriating those elements as materials of their growth, which, if left unconsumed, would deteriorate the atmosphere.

SPHÆROCA'RYA, a genus of plants of the natural family of *Rhamnaceæ*. The species forms moderate-sized trees in Nepaul. *S. edulis* is so called from its fruit being eaten and relished by the Nepaulese, though not very palatable to a European taste. This tree is a native of the forests of Nepaul.

SPHÆROCOCCUS, a genus of plants belonging to the natural order *Algæ*. It was formed by Stackhouse, and applied to the plants belonging to it on account of their globose fructification. A great number of species of this genus have been described, including amongst them some of the most useful of the sea-weed tribe.

SPHAGNUM, the name of a genus of plants belonging to the natural order of Mosses. *S. obtusifolium* is found on the surface of watery turfy bogs throughout Europe. The dense masses of vegetation which it forms in these districts are generally filled with water, so that they will not bear the weight of a human being upon them; and from this cause many animals have lost their lives, being deceived by the apparent firmness this moss gives to a mass of water. When the bog-moss has grown long enough in a lake or bog, its decaying leaves and stems present a soil fitted for other plants, and in this situation the various species of *Drosera*, the *Erica tetrali*, the Cranberry, and others, are frequently found. The other species of Sphagnum are the same in habit as the foregoing. *S. acutifolium*, Narrow-Leaved Bog-Moss, is very abundant, especially in bogs in mountainous situations. *S. cuspidatum*, the Long-Leaved Floating Bog-Moss, seems to be a variety of the last, having peculiar characters from growing constantly under water. It seldom bears fruit. Its stems are sometimes four feet long, and its leaves three-quarters of an inch broad.

SPHE'CIDÆ, Leach (*Sphegides*, Latreille), a family of hymenopterous insects of the section *Fossores*, distinguished by the following characters:—Hinder tarsi at least equal in length to the head and thorax; antennæ generally slender, and formed of elongated joints, which are often arched and contorted, at least in the females; prothorax forming a kind of neck, very distinctly separated from the mesothorax, and contracted in front; the base of the abdomen constricted into a long petiole; mandibles internally toothed. The following are the principal genera contained in this family:—*Pepsis*, *Cerophales*, *Pompilus*, *Ammophila*, *Pronæus*, *Chlorion*, *Dolichurus*, *Ampulex*, *Podium*, and *Pelopæus*.

SPHENOCLE'A, a genus consisting of only a single species, which is remarkable as one of the few which botanists are puzzled to know in what natural order to place. Dr. Lindley, following Martius, has formed it into a suborder *Sphenocleaceæ*, and attached it, with a doubt, to the natural family of *Campanulaceæ*. Endlicher has essentially followed Martius and Lindley, but has imposed upon the genus the name *Pongaticæ*, from the name *Pongatium*, which is applied to it by some botanists, as being the earliest, having been formed by Jussieu from the Pongati of Rheede. The only known species, called *S. zeylanica*, is an annual, growing in all parts of India.

SPHENOCLEA'CEÆ, a natural order of plants, consisting of only one species, belonging to the monopetalous subclass of Exogens.

SPHENO'PTERIS, a genus of fossil ferns. They are all coal-measure plants, and are found in company with *Sigillaria*, *Pecopteris*, and other fossil genera.

SPHERE, or GLOBE, a solid body, the surface of which is everywhere equally distant from a given point or centre within it. This distance of each point from the centre is called the radius.

A section made by a sphere and plane is always a circle. A section passing through the centre is called a *Great Circle*, and one which does not pass through the centre a *Small Circle*.

The centre of a circular section is found by drawing a perpendicular from the centre of the sphere to the plane of the section. All sections whose planes are parallel have their centres on one straight line, namely, the perpendicular to the plane which passes through the centre of the sphere. This straight line is called the *Axis* of the circles, and its extremities on the sphere are called the *Poles* of the circles. The great circle is called the *Primary* and all the others *Parallels:* while great circles passing through the axis of a primary are called *Secondaries*.

By the angle made by two great circles is always understood the angle made by their planes, which is also that made by their tangents at the point of intersection, and that made by the intersections of the two circles with the third circle, to which both are secondary. It is also the angle made by the axes of the two circles.

The angle made by two straight lines drawn from the centre is often confounded with the arc which that angle marks out on the sphere. When this causes any confusion, which it will sometimes do at first, instead of each arc mentioned, read its angle: thus for the arc A B read 'angle subtended by the arc A B.'. Thus when we say that the angle made by two great circles is the arc intercepted between their poles, we mean not to equate the angle to the length of an arc, but to the angle which that arc subtends at the centre.

SPHERE, DOCTRINE OF THE. This phrase is generally used to signify the application of the simple geometrical notions concerning the sphere to geography and astronomy.

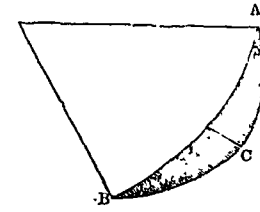
In geography the end is almost gained when a distinct notion is acquired of the meaning of the terms terrestrial latitude and terrestrial longitude, generally abbreviated into latitude and longitude.

There are few problems of much interest connected with geography merely; and it must be remembered that the common terrestrial globe, with its brazen secondary to the equator (called a meridian, very incorrectly, except as meaning that it *may be made* a meridian to any place), its ecliptic, and figured horizon, is almost as much a representative of the sphere of the heavens as of the earth; and the most useful problems are those in which the sphere is used conjointly in these capacities.

The celestial sphere is a fiction, derived from the impossibility of distinguishing the distances of the heavenly bodies, on which account they all seem at the same distances, on a sphere so great that the earth, its centre, is but a point in comparision. But it must be remembered that the appearances of the heavenly bodies conform themselves to this fiction, so that the development of the consequences of the latter amounts to an explanation of the phenomena of the heavens. The doctrine of the sphere is really a part of every work on astronomy.

SPHERICAL TRIGONOMETRY, SPHERICS. These are names given to the application of trigonometry to the investigation of the relations which exist between the sides and angles of triangles drawn on a sphere.

By a spherical triangle is meant that portion of the sphere which is cut off by three arcs of great circles, each of which cuts the other two, as A B C.



SPHEROID, a name given to the class of surfaces which are formed by the revolution of an ellipse about either its longest or shortest diameter. When the longer diameter is the axis, the spheroid is called *prolate;* when the shorter, *oblate*. The earth is an oblate spheroid, or very near indeed to such a figure: hence the oblate spheroid is of much more importance than the prolate spheroid.

SPHINCTER is a name applied generally to the muscles which close the external apertures of organs, as the sphincter of the mouth, of the eyes, &c., and more particularly to those among them, which, like the Sphincter Ani, have the peculiarity of being, during health, in a state of permanent contraction, independently of the will, and of relaxing only when it is required that the contents of the organs which they close should be evacuated.

SPHI'NGIDÆ, a family of Lepidopterous insects belonging to the section *Crepuscularia;* in fact, regarding the family in its most extended sense, it composes the section named.

The section *Crepuscularia* by most authors is placed between the Diurnal and Nocturnal Lepidoptera (sections *Diurna* and *Nocturna*), and corresponds with the genus *Sphinx* of Linnæus.

The insects belonging to this division generally fly in the evening, or early in the morning, but there are many which fly in the day-time. The body is usually stout, and in the typical species remarkable for its pointed apical portion; in some the body is cylindrical. The antennæ are moderately long, angular, and generally increase in thickness from the base, and terminate in an elongated club, having the apex pointed and recurved. The wings when at rest are usually a little inclined, but sometimes horizontal, and in some species the inferior wings project beyond the upper margin of the superior. These inferior wings are provided at the base of their upper margin with a bristle-like spine, which passing through a hook of the upper wing, serves to unite the two wings. The spines in question are visible upon viewing the under side of the insect; they are also found in the Nocturnal Lepidoptera, but here the antennæ are stoutest at the

base, gradually decreasing in thickness. The larvæ are always provided with sixteen legs, six thoracic, eight abdominal, and two anal. In the more typical *Sphingidæ* the larvæ are moreover provided with a spurlike process on the upper surface of the last segment of the abdomen, the point of this somewhat curved and horny process being directed backwards.

According to the views of some authors, the *Crepuscularia* constitute a family, but most modern writers regard this division as one of higher value, and divide it into several families.

As an example of *Sphingidæ*, we may adduce the Death's-Head Hawk-Moth (*Acheronta atropos*). The other families are *Zygænidæ*, *Sesiidæ*, and *Ægeriidæ*.

SPHINX (*σφίγξ*), a fabulous being which occurs in the mythology of Egypt and India; and also in the mythology and art of the Greeks. Greek sphinxes, as we know partly from the descriptions of the ancients, and partly from representations, were portrayed in different ways, but the figure was always a compound of the animal and human form. The human part seems always to have been represented as female. The sphinx appears on various works of art, and also on some coins.

The Egyptian sphinxes have the body of a lion, and are represented in the same recumbent position as those of the Greeks; the upper part of the body is either human, and generally female, or it has the head of a ram. These sphinxes were usually placed so as to form a long avenue leading to a temple. The great sphinx at Jizeh, near the pyramids, which is hewn out of the rock, is 143 feet in length and 62 feet in height in front. There are several small sphinxes in the British Museum. Sphinxes are also found in India as ornaments of temples, but they are always represented with the head of a man. ('Egyptian Antiquities,' in 'Library of Entertaining Knowledge,' i. p. 211, &c.; ii. p. 242, &c.)

SPHINX. [Baboon.]

SPIDER. [Arachnida.] The habits of spiders have formed the subject of an interesting and valuable report drawn up at the request of the British Association for the Advancement of Science, by Mr. Blackwall. This report, which is printed in the Transactions of that body for 1844, is full of new and curious matter. It touches on many points in the economy of spiders hitherto mistaken or imperfectly understood. There are also some valuable memoirs on the same subject in the later volumes of the Linnean Transactions, and several papers on new forms in the 'Annals of Natural History,' by Mr. Adam White; also an important and elaborate account of the anatomy of some species by Mr. Tulk.

Of the discoveries of Mr. Blackwall the most interesting and extraordinary relate to the sexual intercourse of these animals, and to the purposes served by their palpi in aiding in the continuation of the species. The facts made known on this subject are among the most singular discoveries of late years. For them we must refer to the report mentioned.

Mr. Blackwall adds some very curious facts respecting the reproduction of spiders' limbs generally; and enters into some interesting details respecting the monstrosities, occasionally presented by spiders, which have conduced to the introduction of fictitious species.

SPIDER-MONKEY. [Ateles.]

SPIGE'LIA, the name of a genus of plants belonging to the natural order *Spigeliaceæ*. All the species have handsome flowers, and hence are desirable for the garden. *S. Marylandica*, Maryland Worm-Grass, is a native of Virginia, Maryland, Carolina, and Georgia, in rich moist soils, by the edges of woods; also in the forests on the banks of the Arkansas. Although all the species possess active properties, the Maryland Worm-Seed is that which is principally used in medicine. *Spigelia* has slight narcotic powers, and in large doses causes vomiting and purging. In America the fresh plant has decided anthelmintic virtues, but is only useful against the *Ascaris lumbricoides*, or large round worm. In Europe it is little used, as it loses much of its power by keeping. *S. Anthelmia*, annual Worm-Grass, is a native of Guiana, Trinidad, and Brazil. It possesses powerful narcotic properties, and is used in the same manner as the last. This species is often cultivated: it has small pale-red flowers.

SPIGELIA'CEÆ, a small natural order of plants belonging to the monopetalous subclass of Exogens. The order consists of two genera, *Canala* and *Spigelia*, the species of which are natives of America.

SPIGE'LIUS, ADRIAN, was born at Brussels in 1578. He studied philosophy and medicine at Louvain, and afterwards pursued the latter science at Padua, where he received his diploma of doctor. He practised first in his own country, and then in Moravia; but in 1616 he was invited, at the recommendation of his former preceptor Fabricius ab Aquapendente, to take the principal professorship of anatomy and surgery at Padua. He seems to have filled the post with great honour both to himself and to the university, for its reputation was greater in his time than even when Fabricius and Casserius were professors. He died in 1625, of a disease said to have been caused by an accidental wound in the hand, leaving several works which were published after his death by his son-in-law and by Bucretius.

SPIKE is a form of the inflorescence of plants in which the flowers are arranged around a common axis, upon which they are directly seated, no flower-stalk intervening between the axis and the flower, as seen in the *Plantago*.

SPIKENARD is a substance which has enjoyed celebrity from the earliest period of the world's history, and has engaged the attention of numerous commentators on the works of the ancients, as well as of some modern authors. It was one of the substances esteemed by the Greeks and Romans, and is mentioned in the Bible, since the Nard of Scripture is supposed to be the same substance as the Nardos of the ancients, called also *Nardostachys* (*νάρδοσταχυς*), and hence Spikenard, the word *Stachys* being rendered by the word Spike.

There can be no doubt that the nardos de-

scribed by Dioscorides is the Jatamansi of the Hindoos, and probably the same substance which has been mentioned by such writers as Hippocrates. The plant belongs to the natural family of *Valerianeæ*. Differences of opinion exist respecting the nature of the fragrance of the Jatamansi. It may be sufficient to state that it is highly esteemed in the East as a perfume, and is used to scent oils and unguents. Specimens of Jatamansi have been brought to England, and have been found to be very fragrant.

SPILANTHUS, a genus of plants belonging to the natural order *Compositæ*, and the suborder *Corymbiferæ*.

SPILSBY. [Lincolnshire.]

SPINA BI'FIDA, or Cleft-Spine, is a disease commencing in fœtal life, and which consists in an imperfection of the posterior part of the spinal canal. It is almost always accompanied by an excessive secretion of spinal fluid, and in these cases it may be regarded as a disease of the same kind affecting the spinal canal as that which, existing in the skull, constitutes hydrocephalus. The two are indeed not unfrequently coincident; and Spina Bifida is sometimes called Hydrorachis.

Spina Bifida is almost always characterised by a tumour situated over the defective vertebræ, globular, elastic, and fluctuating, often attached by a narrow base, and varying in size according to the extent of the fissure in the spinal canal. It is most common in the lumbar and sacral regions, in which the vertebral arches are latest completed: it is most rare in the neck, and is there also most dangerous, because of the great number of nerves which, by the coincident disease of the spinal chord, may be paralysed. It does not commonly interfere with the general health: but by the friction to which, when the tumours are large, the skin is subjected, and by the distention produced by the increasing secretion of the fluid, the sac is liable to inflame and ulcerate, till, exposing the spinal chord, or its membranes, death is produced by their inflammation; or, the quantity of fluid secreted may be so great as to produce death by its pressure on the chord and brain, in a manner similar to that in which hydrocephalus often terminates. It is mostly an incurable disease.

SPINACH. [Spinacia.]

SPINA'CIA, the name of a genus of plants belonging to the natural order *Chenopodiaceæ*. There are only two species, which are herbaceous plants, with alternate leaves, and axillary flowers of a green colour. One of the species of this genus, the *S. oleracea*, the common Spinach, is well known on account of its use in the kitchen.

Spinach has been cultivated in Europe from time immemorial, but its native region was not known till Olivier announced that he had found it wild in Persia. It does not appear to have been known to the ancients. It is first mentioned by Arabian physicians, and appears to have been known to the Spaniards from a very early period. For the winter crop the seed is sown at the beginning of August. A light, dry, rich soil should be preferred, and, if possible, in a sheltered situation. When the plants have put forth two pair of leaves, the ground should be hoed and the plants thinned. By October or November the outer leaves of the spinach are fit for use. In February, when fine weather occurs, the plants should be again attended to, cleaned, and thinned out, and in this way it may be made productive till April or May, by which time the summer sort will be ready. The first sowing of the round-leaved spinach or smooth-fruited should take place at the end of January in some sheltered border. This crop should be successively thinned out till the plants are eight or ten inches apart. Successive sowings may be made, in order to insure a constant supply in February, March, and April, and, if desirable, these sowings may take place between rows of cabbages, &c.

SPINE. [Skeleton.]

SPINE, in Botany, is applied to the sharp hard conical extremities of the branches of plants. The spine is seen in great perfection in the Gleditschia, sloe, white thorn, and other plants. It seems to arise from the want of perfect development of the growing point of the plant.

SPINELLI, PARRI, was the son of Spinello Aretino, and was born at Arezzo, apparently about 1388-90. He was first instructed by his father, and was afterwards employed by Lorenzo Ghiberti in Florence as an assistant in preparing the celebrated gates of the Baptistery of San Giovanni, which were executed between 1402 and 1424. He painted chiefly in Arezzo, and Vasari enumerates many of his works, but few now exist.

He was an excellent colourist, and was the best practical fresco painter of his time. He is supposed to have died about 1408.

SPINET, a musical instrument of the harpsichord kind, formerly much in use. The Spinet had but one string to each note, which was struck by a quilled jack, the latter being acted on in the usual manner by a key. It was smaller than the harpsichord.

SPINNING. This art consists in the preparation of a continuous thread from short fibres. Whatever be the substance operated upon by the spinner, whether cotton, wool, flax, or silk, it is necessary in the first place to lay the fibres or filaments parallel with each other, so as to form them into a soft continuous ribbon or cord, sometimes called a *sliver*. Excepting in the case of flax, this is done by a carding or combing process, the object of which is to disentangle and straighten the tangled filaments. If such a sliver or cord be firmly griped or compressed at two points rather farther apart than the average length of its component filaments, it may be extended or drawn out to a greater length; the filaments sliding upon each other. When two or more such cords have been extended in this way, until they will stretch no longer without separating or being pulled asunder, they may be laid parallel to each other, and combined by being slightly twisted together. The compound cord thus formed may be again extended by stretching or drawing; and the repetition of the processes of doubling, twisting, and stretching will enable the spinner to extend the length and diminish the thickness of the cord until it becomes a fine compact thread or yarn.

The primitive modes of spinning by the spindle

and distaff, and by the spinning-wheel, which are still extensively practised in the East, and not entirely superseded in some remote districts of Scotland, only enable the spinner to produce a single thread; but with the almost automatic spinning-machinery which has been called into existence by the cotton manufacture, one individual may produce nearly two thousand threads at the same time. The history of the series of inventions by which this result has been gradually attained has been already given in the articles ARKWRIGHT and COTTON SPINNING. In respect to flax, the preliminary processes are described under FLAX. As the fibres of flax have not the same tendency to mutual entanglement as those of wool and cotton, it is necessary to moisten them with water to make them adhere to each other during the process of spinning, and also to render them more pliable and easy to twist. Until recently, cold water was used for moistening the flax for machine-spinning; but the substitution of hot water for that purpose has been found a great improvement.

The manufacture of yarns or threads of silk is a process essentially different from the spinning of cotton, wool, or flax. Instead of combining a number of short fibres into a long thread, the silk-throwster receives the silk in the form of very long and exceedingly fine filaments, which merely need cleansing and twisting together until the requisite strength is attained. The twisting process is, in this case, called spinning. There is however besides the best portion of the silk, which is wound off from the cocoon, a quantity of loose or *floss* silk, which forms a soft tangled mass enveloping it. This, with the refuse of the superior part of the silk, under the general name of *waste*, is converted into yarns for coarse or inferior articles, by a process very similar to that of spinning other fibrous substances. This waste silk was formerly cut by a machine, to reduce its filaments into short lengths, and then treated much in the same way as cotton wool; but the process of manufacturing it into yarns has been recently much improved by the adoption of contrivances similar to those used in flax-spinning, by which the filaments are heckled or drawn out into a sliver without being cut. The spinning of hempen fibres into cordage is described under ROPE. In many of the smaller kinds of ornamental spunwork, caoutchouc or India rubber is now largely used. [CAOUTCHOUC.]

SPI'NOLA, AMBRO'SIO, MARQUIS OF, was born at Genoa in 1569, of a family that had amassed considerable wealth by mercantile speculations. In 1601 his brother Frederic, who had entered the service of Philip III., was appointed admiral of the Spanish fleet on the coast of the Netherlands, and shortly after was empowered to raise a body of troops to operate against the insurgents of Flanders. He then went to Genoa, and prevailed on Ambrosio, who had been hitherto engaged in mercantile pursuits, to take the command of the land forces, whilst he scoured the sea with his fleet. Ambrosio, left Milan in May, 1602, and entered the Low Countries, where he served at first under Mendoza with no great success, Sept. 20. In May (1603) his brother Frederic was killed in a naval engagement with the Dutch. Shortly after Spinola was appointed general-in-chief of the Spanish forces in the Netherlands, and he began the campaign by an unsuccessful attempt to relieve the town of Sluys, which was besieged by the Prince of Nassau. He was then sent against Ostend, which had long been besieged by the Spaniards, and after it had sustained a siege of three years and two months, Spinola obtained possession of it, but only as a heap of ruins. During the next campaign he succeeded in keeping the enemy in check. A decisive naval action, in which the Dutch admiral Heemskerk destroyed the Spanish squadron near Gibraltar (1607), led to an armistice being concluded between Spinola and Maurice for twelve years (1609). The war was renewed in 1621, owing to the disputed succession to the duchy of Cleves. Spinola commanded the Spanish forces, and Maurice was again his opponent. The advantage however remained entirely with the former. Whilst trying to relieve Breda, the Prince of Nassau died, and after ten months' siege Breda opened its gates to Spinola in June, 1625. In 1629 Spinola was employed against the French in Italy, but he was unable to gain any decisive advantage. He died in 1630.

SPINO'ZA, BENEDICT, the son of a Portuguese Jew at Amsterdam, was born in that city, the 24th of November, 1632. He was christened Baruch, but on his renouncement of Judaism he always called himself Benedict. From his infancy he exhibited remarkable indications of mental acuteness, and his frail sickly constitution forced him to find solace in study. He became well versed in the Hebrew language, and learnt also Italian, Spanish, German, and Dutch. His early studies were principally the Bible and Talmud. His original mind led him to speculations on which was grounded a charge of infidelity made against him to the synagogue. The affair ended in his leaving the Jews.

A physician called Vanden Ende, who was himself accused of scepticism, instructed Spinoza in Latin and Greek. Spinoza's Latin was useful in his new philosophical studies, for which he had abandoned theology. To the works of Des Cartes he acknowledged that he owed all his obligations. After leaving the Jews he did not profess any form of Christianity. He got his living by making glasses for telescopes and microscopes, an art in which he excelled. He spent the last part of his life at the Hague in great seclusion, and in the practice of the most rigid economy. He was a quiet, temperate, modest, retiring man. His only relaxation from his severer studies was his pipe. His virtues endeared him to all who knew him; but theologians and others, who knew his opinions very imperfectly, were his bitter enemies. He died of consumption in the forty-fifth year of his age, A.D. 1677. There is an edition of his works in 2 vols. 8vo., by H. E. G. Paulus, Jena, 1803.

It has been the ill fate of Spinoza to be branded as an atheist, a cry in which even Voltaire joined; and yet no honest man who had looked into Spinoza's works could possibly form such an

opinion. His 'Ethica' is the work that has attracted most attention. He constructs his system on certain definitions and axioms, from which he proceeds to demonstrate his propositions in as strict a manner as a geometrician. It treats, I. Of God. II. Of the Nature and Origin of the Mind. III. Of the Origin and Nature of the Affections. IV. Of Human Servitude, or the Strength of the Affections. V. Of the Power of the Intellect, or of Human Liberty. This was a posthumous work of Spinoza, but it is that which exhibits his real system; for his exposition of the philosophical principles of Descartes, and his 'Cogitata Metaphysica,' a kind of appendix to it, were not intended by the author to be passed off as his own, though the 'Cogitata' certainly contains some of his own peculiar opinions.

There are few persons who would have the patience to examine the writings of Spinoza. To understand them requires much labour, and a mind accustomed to speculation. He was undoubtedly a profound thinker, and one of the most earnest and sincere of men in the pursuit of truth. The article 'Spinozism,' in the 'Penny Cyclopædia,' contains a general exposition of his doctrines.

SPIRÆA, a genus of plants of the natural family *Rosaceæ*, tribe *Spiraceæ*. The species, upwards of 50 in number, form small unarmed shrubs or perennial herbs. Flowers white or reddish. They are found in Europe, North America, Siberia, China, and the Altai and Himalaya Mountains. Several form ornamental shrubs and herbs, which are found in our gardens, and are of easy cultivation. *S. ulmaria*, or Meadow-Sweet, is found in our meadows, and *S. filependula* on our downs, &c. Pigs are said to be fond of the tubers of the roots. Several of the species are astringent, and might be used in tanning. *S. trifoliata* is sometimes called Ipecacuanha of Virginia, being employed as an emetic.

SPIRAL, a name belonging properly to curves which wind round a point in successive convolutions. The easiest mode of representing such curves algebraically is by means of polar Coordinates; hence, in many of the older English works, any curve referred to such co-ordinates is said to be considered as a spiral. Thus we have the circle considered as a spiral; the ellipse considered as a spiral, and so on.

SPIRE (in German, *Spitze*, or *Thurm-Spitze*; in French, *Flèche*, from its resemblance to the pointed tip of an arrow; but the Latin *Spira* signifies a coil, or spiral line, and not an upright cone or pyramid). The term belongs to gothic architecture, and is used to designate the tapering pyramidal mass erected on a tower by way of finish and ornament.

The origin of the spire, like that of the pointed arch, is merely matter of conjecture. The probability is that it arose out of the peaked roof usually given to campaniles and towers of a preceding period, which form was afterwards gradually improved upon and refined, till it eventually grew up into the slender tapering spire. A gradual and progressive transition, cannot however be clearly traced. On the contrary, some of the earliest deviations from the simple pyramidal form appear to have produced uncouthness rather than lightness; for although much greater loftiness upon the whole was so occasioned, the appearance of it was reduced by the sides of the tower being made to terminate in gables cutting into, and therefore partly cutting off, the base of the pyramid or spire itself. Many of the earlier German edifices contain examples of this peculiarity.

There are so many peculiarities in spires that it is highly desirable to have descriptive terms for them. First, as regards its base, a spire may be said to be *Cluster-Based* when surrounded below with pinnacles connected with it, and from among which it seems to spring up; of which kind St. Mary's, Oxford, is a celebrated example. The Hôtel-de-Ville, at Ypres, has a spire clustered with four exceedingly tall pinnacles or lesser spires. Where there are windows placed against a spire, rising upright like the dormers or lucarnes on a roof, the term *Lucarned* would express that character. *Crocketed* and *Banded* are terms requiring no explanation; but in regard to the first it may be remarked, that spires, otherwise quite plain, are sometimes ornamented with *crockets* along their edges; and with respect to *bands*, they are sometimes little more than string-mouldings, but in other cases broad and enriched surfaces. *Finialled* is a term which does not apply to any of our English spires; but that of St. Stephen's, Vienna, and some other continental spires, have an exceedingly large and rich finial, which ornament gives them a particular boldness of expression. The *Tabernacle-Spire* also is one of which there is no example in this country, but of which the one just mentioned, and those of Strassburg, Ulm, Thann in Alsace, and many others, are specimens. Neither have we any instances of *Open-Work* spires, or of such as, if not actually perforated, are yet entirely covered with tracery. That at Freyburg, and those at Burgos and Batalha, are exceedingly rich specimens of the kind.

There are various other circumstances which, though they do not affect the spire itself, produce greater or less difference in regard to the character of the structure of which it is a component feature. Very much, for instance, depends upon its situation in the general plan: at Salisbury, Norwich, and Chichester, the spire is raised upon a tower at the intersection of the cross, or in the centre of the plan; whereas in most continental churches there are two spires on the towers of the west front, though in some instances (Strassburg, Antwerp) only one has been erected. Several however have a single tower and spire in the centre of the west front (Ulm, Freyburg, Thann in Alsace), in which case the tower itself begins to diminish almost from the ground, and the whole becomes of the tabernacle character. In most of our English churches (not cathedrals) the spire is placed upon a tower at the west end, as at Grantham, Louth, Bloxham, &c. If we except Peterborough, where they are very diminutive, the only English cathedral which has two western spires is Lichfield, which is further remarkable as having a central tower and spire also.

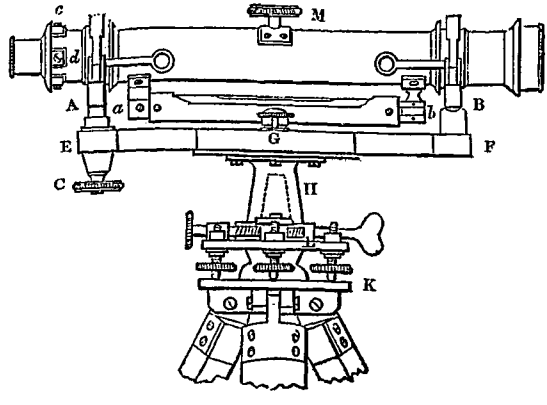
SPIRE. [SPEYER.]

SPIRIT, *in Chemistry*. This word, especially when employed by itself, is now almost exclusively applied to spirit of wine, or alcohol. Formerly however the word spirit was given to most substances capable of being vaporised and condensed by distillation, and to some not obtained by distillation. It will be requisite merely to name a few of those compounds to show how extensively it was used, and misapplied to substances of very different origin and composition. Thus nitric acid was called Spirit of Nitre; hydrochloric acid, Spirit of Salt; sulphuric acid, Spirit of Sulphur; chloride of tin, Spirit of Libavius; solution of ammonia, Spirit of Sal-Ammoniac, and so forth.

SPIRIT-LEVEL, a tube of glass nearly filled with spirit of wine or distilled water, and hermetically sealed at both ends, so that when held with its axis in a horizontal position, the air which occupies the part not filled with the spirit or water places itself contiguously to the upper surface. The tube being supposed to be perfectly cylindrical, the exact horizontality of its axis is ascertained by the extremities of the air-bubble being at equal distances from the middle point in the length of the glass.

The spirit-tube is placed within a brass case having a long opening on the side which is to be uppermost, and is attached to a telescope; the telescope and tube are then fitted to a frame, or cradle, of brass, which is supported on three legs. In the interior of the telescope, at the common focus of the object-glass and eye-glasses, are fixed generally two wires, at right angles to each other, their intersection being in the line of collimation, or that which joins the centres of all the lenses.

The case containing the spirit-tube turns on a



joint at one extremity, as *a*, by the revolutions of a screw, *b*, at the opposite extremity; and the telescope rests, near each end, within two arms at the top of a small pillar, A or B. The pillar and its arms resemble the letter Y, and one of them is made capable of a small movement in a vertical direction by turning a screw, C. The pillars are at the extremities of a brass plate, E F, the under side of which is connected with the tripod-stand, which supports the whole instrument; and a compass-box, G, is attached immediately to the plate, as in the cut, or is raised above the telescope by means of four small pillars. A hollow conical socket, H, of brass is intended to receive a piece of bell-metal of a corresponding form, which constitutes the upper part of the stand. This piece serves as a vertical axis, upon which the telescope, the spirit-level, and the compass are to turn round horizontally. The three legs which are to support the instrument are firmly fixed to a circular plate, K, perforated at its centre, and having about the perforation a hollow spherical zone, resembling a small inverted cup.

In order to perform the adjustments, the telescope should, by a proper opening of the legs of the stand, be at first rendered as nearly level as can be estimated by the eye; then, having been turned so as to lie vertically above the line joining two opposite screws in what is called the parallel plate K, the spirit-tube is brought to a horizontal position by relaxing the screw nearest to its higher end, and tightening that which is opposite to it; the like operation is to be performed with the other pair of screws, after placing the telescope vertically above them. The bubble of air now occupying the middle of the tube, let the telescope be reversed in the arms (the Ys, as they are called); then, if the bubble does not still occupy the middle, it must be made to do so by successive trials, endeavouring to correct half the error by means of the screw *b*, and the other half by the screw C.

The eye-piece of the telescope must be moved inwards or outwards till the wires in the field of view are distinctly seen; and the object-glass must also be moved by means of the pinion, M, till the station-staff, placed at any convenient distance (suppose 100 yards), is also distinctly seen. It is necessary besides that the intersection of the wires should be precisely in the line of collimation, or the optical axis of the telescope: for this purpose the point of intersection should be directed to some well-defined mark at a considerable distance. The telescope must then be turned on its axis; and if the intersection remains constantly on the mark, that adjustment is complete; otherwise it must be rendered so by means of the screws, *c*, *d*, &c., on the telescope. A few repe-

titions of each adjustment will probably be necessary before the errors are wholly removed.

Mr. Gravat, who has made considerable improvements in the mechanism of these instruments, uses a particular method for ascertaining and correcting the errors in the positions of the cross-wires and spirit-tube, for an account of which we must refer to the 'Treatise on Mathematical Instruments,' by Simms.

The Levelling-Staff till lately in general use for finding the relative heights of ground is a rod consisting of two parts, each six feet long, which, by being made to slide on one another, will indicate differences of level nearly as great as twelve feet. The face of the rod is divided into feet, inches, and tenths, or into feet with centesimal subdivisions; and a vane, or cross-piece of wood, perforated through the middle, is moved up or down upon the rod by an assistant till a chamfered edge at the perforation is seen by the observer at the spirit-level to coincide with the horizontal wire in the telescope. The rod proposed by Mr. Gravat is divided into hundredths of a foot by stripes which are alternately black and white, and are numbered at every foot in the usual way with figures great enough to be seen on looking through the telescope; the tenths of a foot are indicated by lines longer than the others. A similar staff has been proposed by Mr. Sopwith and Mr. W. P. Barlow.

SPIRITS. [Wines and Spirits.]

SPIRU'LIDÆ, Professor Owen's name for a family of polythalamous, decapodous, dibranchiate *Cephalopoda*, thus characterised by him :—

Animal corresponding in external form to the decapadous type; internal organisation unknown, presumed to be dibranchiate. Shell partly internal; cylindrical, multilocular, discoïd; the whorls separated; septa transverse, concave next the outlet, and with regular intervals. Siphon marginal and internal, uninterrupted.

Genus *Spirula*, Lam.

The character of the family is also that of the single genus of which it is at present composed.

Example.—*Spirula Australis*, Lam.

SPITZBERGEN is a group of islands situated nearer to the arctic pole than any other country on the globe. It lies between 76° 30′ and 80° 30′ N. lat., and between 9° and 22° E. long, and is surrounded by the Arctic Polar Sea, of which that portion which lies west of Spitzbergen is called the Greenland Sea.

The group consists of three larger and numerous smaller islands. The largest island is on the west, and extends from 76° 30′ to 80° N. lat.; it is properly called Spitzbergen, and its most eastern part is now called New Friesland. To the east of New Friesland lies North-East Land, which extends from 79° 10′ to 80° 10′ N. lat., and is divided from the larger by the Henloopen or Waygatz Strait, which is about 70 miles long, and varies in breadth from 4 to 11 miles. East of the main body of Spitzbergen is Edges Island, which extends from 77° 15′ to 78° 15′ N. lat., and is separated from New Friesland by a strait called Walter Tymens Fiord, or Alderman Freeman's Inlet. This strait is somewhat more than 50 miles long, and less than 10 wide. Along the southern coast of Edges Island numerous small islands cover the sea to a distance of 15 miles from the shores, and this group goes by the name of the Thousand Islands; and numerous small islands lie adjacent to other parts of the coasts. At the distance of 12 or 15 miles from the western coast of Spitzbergen is Charles Island or Forland, which is about 40 miles long, but only a few miles wide.

Most parts of the shores of these islands which have been visited are rocky, and mountains extend from the shores inland. Among the sounds, bays, harbours, and creeks which have been visited are Horn Sound, Bell Sound, Ice Sound, Green Harbour, English Bay, King's Bay, Cross Bay, Magdalen Bay, Smeeresberg Bay, Fair Haven, Vogel Sang, Love Bay, Hecla Cove, and Treurenberg Bay. Near the head of King's Bay there are three piles of rocks of a regular form, called the Three Crowns, which resemble the pyramids of the ancient Mexicans. They rest on the top of a mountain, and each commences with a square table or horizontal stratum of rock, on the top of which is another of similar form and height, but of smaller area; this is continued by a third and fourth, and so on, each succeeding stratum being less than that immediately below it, until it forms a pyramid of steps, almost as regular as if it were worked by art. Near Horn Sound is an immense glacier which extends 11 miles along the coast, and presents a front edge from 300 to 400 feet high.

Extending to within 10° of the pole, the climate of Spitzbergen is intensely cold. The mean temperature of the three warmest months on the western coast does not exceed 34.50°, and even at that season this part of the island is occasionally subject to a cold of three, four, and more degrees below the freezing point. In the northern parts the longest day is four months; but from the 22nd of October to the 22nd of February the sun does not rise above the horizon. The winter is not only intensely cold, but stormy.

The number of species of plants which have been found in Spitzbergen hardly exceeds forty, but vegetation is very rapid. Most of the plants spring up, flower, and produce seed in the course of a month or six weeks. The islands do not produce vegetables suitable or sufficient for the nourishment of a single human being. The animals met with are foxes, bears, rein-deer, whales, morses, seals, and sea-fowl.

Spitzbergen was discovered in 1596 by Barentz, Hemskerke, and Ryp, in their endeavour to effect a north-east passage to the Indies. It was named by them Spitzbergen (pointed mountains) from the numerous peaks observed on the coast. In 1607 it was visited by Henry Hudson, and four years afterwards the English began to resort to it for the whale fishery. In 1743 four Russians were left there for six years. Since that time the Russians have frequently visited these islands.

SPLACHNUM, the name of a genus of cryptogamic plants belonging to the natural family of Mosses. They are generally annual plants, and remarkable amongst their tribe for their size and beauty as well as singularity. Seven of the

species are British. The most common in England is the *Splachnum ampullaceum*, Purple Gland-Moss, which is found growing chiefly on rotten cow-dung. *S. sphæricum*, Green Globular Gland-Moss, is a native of alpine situations in the north of Europe and Scotland. It occurs in green tufts, and has elegant slender wavy tawny fruit-stalks from one and a half to three or four inches high. *S. rubrum*, Red Umbrella Gland-Moss, is a native of Norway, Finland, Russia, and Siberia.

SPLEEN (Σπλήν). The purpose which this organ serves in the animal economy still remains entirely unknown.

The spleen is an organ which is not found in any tribe below the class of fishes. Some animals have two, and this number has sometimes been found in man. Its form is generally somewhat oval, being smooth and convex on the exterior, where it is in apposition with the diaphragm, and irregularly concave on the opposite side, which is unequally divided into two parts by a transverse slit for the transmission of its vessels. It is for the most part placed in the left hypochondriac region, between the diaphragm and the stomach, and beneath the cartilages of the ribs. It varies so much in size that it is almost impossible to say what are its normal proportions. It is much enlarged by disease; but in health, taking a general average, its greatest diameter may be said to measure about four inches, its breadth three, and its thickness from two to two and a half; its usual average weight is from eight to ten ounces. It is of a slight spongy consistence, and is at all times easily torn; and in many cases it is found, soon after death, so soft as to be readily broken by a slight pressure, when it appears a grumous, dark, confused mass. Its colour is deeply red, with a tinge of blue, particularly round its margin. It has a peritonæal investment prolonged to it from the stomach, by which, as well as by vessels, it is connected with that organ; but it has also a smooth and fibrous tunic proper to itself, which is so firmly adherent to the serous investment above mentioned, that they cannot be separated except at its concave surface. No organ receives a greater number of blood-vessels in proportion to its size than the spleen; but it secretes no fluid of any sort, at least none that has hitherto been discovered.

Diseases of the spleen do not very frequently occur in this country, but they are by no means of unusual occurrence in moist climates, whether warm or temperate, as Italy, Holland, South America, and some parts of India.

SPLEENWORT. [Asplenium.]

SPLINT. [Fracture.]

SPOFFORTH, REGINALD, was born in 1768, at Southwell, in Nottinghamshire, and received his early musical instructions from his uncle, organist of the Collegiate Church of that place. Repairing to London, he took lessons on the piano-forte from Steibelt, and completed his studies in harmony under Dr. Benjamin Cooke. He was in great repute as a teacher, but as a composer he is known only as a glee-writer. Two of his earliest glees gained, in the year 1793, the prize gold medals given by the Catch-Club. He died in 1826.

SPOHN, FRIEDRICH AUGUST WILHELM, was born May 16, 1792, at Dortmund. He was educated at the university of Wittemberg, and afterwards went to Leipzig, where he was, in 1817, made professor extraordinary of philosophy, and in 1819 professor in ordinary of ancient literature. He was a scholar of the greatest industry, and died at an early age, Jan. 17, 1824, worn out by the severity of his studies. He illustrated antiquity by a variety of works in the several departments of criticism, philology, and geography. He published an edition of the 'Odyssey,' with valuable dissertations prefixed. In 1822 he was employed in examining and arranging the Egyptian antiquities brought to Berlin by Minutoli. His work on the language and character of the ancient Egyptians was published after his death by Seyffarth, Leipzig, 1823.

SPOLE'TO-E-RIE'TI, an administrative division of the papal state, formed by the union of the provinces of Rieti and Spoleto. The province of *Rieti*, which comprises part of the territory of the ancient Sabines, is almost entirely covered with offshoots from the Apennines. It lies wholly in the basin of the Tiber, and is drained by the Velino, which, swelled by the Salto and the Turano, flows through the fertile plain of Rieti, and forms, at its junction with the Nera, the beautiful falls of Terni. The western part, or province of Spoleto Proper, a portion of ancient Umbria, consists of the valley of the Nera, one of the principal affluents of the Tiber, the valley of the Maroggia, another affluent of the Tiber, and of several ridges of highlands between these various rivers. The area and population of the two provinces are as follows:—

Provinces.	Area in sq. m.	Pop. in 1843.
Spoleto . . .	1130	121,453
Rieti . . .	513	67,018
Total . .	1643	188,471

Spoleto-e-Rieti is bounded E. by the kingdom of Naples, N. by the provinces of Ascoli and Camerino, W. by those of Perugia and Viterbo, and S. by the Comarca of Rome. The plain of Rieti and the river valleys are fertile in corn, wine, oil, and fruits; the highlands are in general poor, but yield tolerable pasture, and in many parts are clothed with oak and chestnut woods.

Spoleto, the head town of the province, situated on a hill above the Maroggia, is the ancient *Spoletum*, the inhabitants of which repulsed Hannibal's attack after the battle of Thrasimenus, and thus checked his advance towards Rome. ('Livius,' xxii. 9, xxvii. 10.) An inscription above one of the gates records the event. Spoleto has a handsome cathedral, adorned with frescoes by Filippo Lippi. Several other churches, the town-house, and the Ancajani Palace, are also worthy of notice. The castle of Spoleto contains some remains of Cyclopean walls. There are also remains of a Roman theatre, of several temples, and other antiquities. The city gives title to a bishop, and has a college; manufactories of hats and woollens; and about 7000 inhabitants. It

carries on a considerable trade in corn, oil, wine, and truffles, the produce of the neighbourhood. An aqueduct, which served also as a bridge, crosses the Maroggia; it is a work of the Longobard times, but is now in a ruinous state.

The other towns of the province are:—*Terni*, the ancient *Interamna*, built near the confluence of the Velino with the Nera, a bishop's see, with an old cathedral, the remains of an amphitheatre and temple, and about 6000 inhabitants. The territory of Terni produces much oil and some wine. The country is full of picturesque localities. *Narni*, an ill-built episcopal town, situated in the valley of the Nera, occupies the site of the ancient Narnia, and has a cathedral, several churches and convents, and about 3000 inhabitants. RIETI. *Norcia*, the ancient *Nursia*, at the northern extremity of the province, near the borders of Naples, and at the foot of the lofty Apennine group called Monte della Sibilla, the ancient Mons Tetricus, is 1200 feet above the sea; it is a bishop's see, and has 3000 inhabitants. A great number of swine are reared in the neighbourhood. The Corno, an affluent of the Nera, flows through a deep glen near Norcia. *Cascia*, on the Corno, south of Norcia, among the highlands of the Apennines, is situated near the site of the ancient towns of Carseoli and Marruvium. Medals, idols, and other remains of ancient times have been found in the neighbourhood. The whole of this highland region, though very interesting, is little known, being removed from the high roads, and scarcely ever visited by travellers. The mountains are covered with chestnut and oak trees. Cascia and its territory contain 3000 inhabitants.

SPON, JACOB, was born at Lyon, 1647, and educated at Strassburg. He took the degree of doctor of medicine at Montpellier, and returning to his native place in 1669, studied medicine and archæology. In 1675 he went to Italy, and spent some time at Rome studying ancient art. At Venice he met with an English traveller, Sir George Wheler, and set out with him on a tour to the East. Their route lay through Dalmatia, the Archipelago, Constantinople, and Asia Minor: they then visited Athens and the Peloponnesus. Spon returned to Lyon in the middle of the year 1676. In 1678 he published his Travels, printed at Lyon, 3 vols. 8vo.; reprinted Amsterd., 1679, 2 vols. 12mo. Being a Protestant he quitted Lyon before the revocation of the edict of Nantes, and he died at Vevay in 1685. His archæological works are valuable; and his travels show his learning and the accuracy of his observation. Spon and Wheler saw the Párthenon of Athens before it was damaged by the siege of the Venetians, 1687. The work of Spon contains inscriptions both Greek and Roman. Many of the Greek inscriptions relate to the demi of Attica.

SPONDEE (*spondeus*, σπονδεῖος) is a foot which consists of two long syllables (- -).

SPONDIA'CEÆ, the name of a natural order of plants belonging to the syncarpous group of polypetalous Exogens. The plants of this order are trees without spines. They are natives of the West Indies, the Society Islands, and the Isle of Bourbon. The fruit of some of the species of *Spondia* is eatable, and is known in the West Indies by the name of Hog Plums.

SPONDY'LIDÆ, a natural family of marine *Conchifera*, under which may be arranged the genera *Plagiostoma*, *Podopsis*, *Dianchora*, *Pachytes*, *Spondylus*, and *Plicatula*. Of these few if any have a just claim to generic appellation except *Spondylus* and *Plicatula;* the latter can with difficulty be distinguished from *Spondylus*, and if its distinction be admitted can only retain the rank of a subgenus. (See Deshayes, in his edition of Lamarck.)

Spondylus.—Animal oval, oblong; the borders of the mantle disunited, thick, and furnished with many rows of tentacular cirrhi, many of which are truncated and terminated by a smooth and convex surface. Mouth oval, furnished with great cut lips, and on each side with a pair of oblong and pointed labial palps. Branchiæ in form of a crescent, and formed of detached filaments. Foot rudimentary, on the disk of which a club-shaped pedicle raises itself. Anus floating behind the adductor muscle of the valves. (Deshayes.)

Shell inequivalve, adherent, auriculated, beset with spines or rough; the umbones unequal; the lower valve offering an external cardinal facet which is flattened and divided by a furrow, and which increases with age. Hinge with two strong teeth in each valve, and an intermediate fosset for the ligament, communicating by its base with the external furrow. Ligament internal, the ancient remains of which show themselves externally in the furrow. (Lamarck.)

The spines with which the *Spondyli* are armed, in some instances very long, must have struck everybody, and also that they bristle out on every side from the upper valve. The lower valve is attached, and adheres to submerged bodies by means of foliations. If the whole lower surface adheres, as it often does, not a spine is given out from the lower valve; but, where the adhesion takes effect towards the anterior part of the lower valve only, as is very frequently the case, especially when the shell is affixed among the branches of corals, a favourite locality with some species, the foliations are confined merely to that part where adhesion is required, and the rest, or free part of the valve, is as profuse of spines as the upper valve itself. There are two points to be gained, support, or adhesion, and defence; the first is of primary importance, but as soon as that is safe, all the resources of the animal seem to be turned towards its defensive and offensive armour. Those fishes which browse among the corals are thus deterred from injuring the living fixture which has there taken up its abode. A very fine series of specimens was collected with a view to this habit, and they showed not only the power which the animal had of secreting the proper process of shell according to the circumstances required, but of modifying the secretion according to the exigencies of the occasion.

But there is another, and more interesting phenomenon, well displayed in one of the species of this genus. Professor Owen, having been led to reflect, while considering the uses of the camerated part of the shell of *Nautilus*, upon the

degree or extent of that structure as possibly dependent upon the mode of growth of the animal and its shell, and how far it was a necessary physical consequence of the increase and change of position of the animal, independently of any special purpose served by the forsaken parts or chambers of the shell, had paid attention to all the cases that had come under his observation of the formation of chambers in shells, by the secretion, on the part of the animal, of a nacreous layer, forming a new basis of support to the soft parts, and cutting off the deserted portion of the shell from the chamber of occupation. He laid a series of observations on the structure of the Water-Clam (*Spondylus varius*, Brod.) before a meeting of the Zoological Society of London in June, 1837, and he observes that it is well known that the process above adverted to is not the only mode adopted to suit the shell to the changing form and bulk, or other exigencies of its occupant.

After adverting to *Magilus*, and to *Helix decollata*, Professor Owen points out the fact that the *Ostreæ* not unfrequently present shallow and irregular chambers in the substance of the shell, and that the *Etheriæ* have vesicular cavities interposed between the testaceous laminæ; but he states that the most constant and remarkable example of the camerated structure of the shell is presented by the large *Spondylus*, or Water-Clam above named, so called from the fluid which (until lost by slow evaporation) occupies the chambers, and which is visible in the last-formed chamber through the thin semi-transparent exposed septum.

In order to examine this camerated structure, and more especially to see how it was modified by the presence and progressive change of place of the adductor muscle, he had a fine specimen sawn through vertically and lengthwise: it measured eight inches in length; the substance of the concave valve, which was two inches and one-third in thickness at the thickest part, included fourteen chambers, separated from each other by very regularly-formed and stout partitions, composed, as in other chambered shells, of the nacreous portion or constituent of the shell. The septa were slightly undulating in their course, but presented a general concavity towards the outlet of the shell. Not any of these partitions were however continued freely across the shell, but each became continuous at the muscular impression, which is near the middle of the shell, with the contiguous septa. In general also the septa commenced singly from the cardinal or upper wall of the valve, and divided into two when about one-fourth of the way towards the opposite or lower wall; the thickness of the undivided part of the septum being equal to or greater than that of the two divisions of layers into which it splits.

The fluid contained in the chamber was turbid, had an acid saline taste, and a rank disagreeable odour. After standing for twenty-four hours, it deposited a whitish curdy sediment, and became clear and transparent. The clear fluid was poured from the sediment, and was subjected to various tests. It was neither acid nor alkaline; it produced a very copious precipitate with the nitrate of silver, indicating the presence of a large proportion of muriatic acid; the muriate of barytes indicated a slight trace of sulphuric acid; while the appropriate tests of lime, magnesia, and iodine, produced no effect. A portion of the fluid was evaporated by a gentle heat, when a quantity of crystals of the muriate of soda was obtained, amounting in weight to very nearly 20 per cent. of the fluid. After the removal of the crystals, a little brown matter was left in the capsule, but in too minute a quantity to enable Dr. Bostock to ascertain its nature and properties, except that it was not soluble in alcohol: we may however, he observes, presume that it gave the fluid its peculiar flavour and odour. It appeared then that the fluid in question consisted almost entirely of a solution of pure muriate of soda, differing therefore in its chemical constitution from sea-water. The sediment above mentioned appeared to consist of small globular or rather pyriform bodies, probably of an organic origin.

Spondylus has been found attached to rocks, corals, other shells, &c., at depths varying from the surface to 17 fathoms in the seas of warm and temperate climates (the Mediterranean for instance). The finest and most beautiful species are natives of tropical and intertropical localities.

Plicatula.—Shell inequivalve, inauriculate, narrowed towards its base; the upper border rounded, subplicated; with unequal umbones, and without external facets. Hinge with two strong teeth in each valve. A fosset between the cardinal teeth, receiving the ligament, which is entirely internal. (Lamarck.)

Locality, the seas of warm climates, where it has been found adhering to stones, shells, and other submarine bodies, at depths varying from 4 to 11 fathoms.

SPO'NGIA, the name under which Linnæus and many subsequent systematists have ranked the very numerous forms of organisation to which we generally give the term Sponge, and of which the sponges of commerce afford familiar examples. Generally, and we think justly, zoologists have claimed these organisations for the animal kingdom, and ranked them among the zoophyta; but there are eminent writers who dissent from this view on different grounds, and prefer to rank the marine and fresh-water sponges with plants. That the animal and vegetable organisations both terminate obscurely toward the inorganic structures of creation, and that in this approach to their common boundary they touch and melt into each other at more than one point, are propositions which, for the purpose of the present argument, and in the actual condition of natural history, seem to require no proof; but much of the difficulty which is admitted or supposed to attend an exact determination of the animal or vegetable nature of certain stony corals (*Nullipora*, Lamarck), *Spongiadæ*, *Corallinadæ*, &c., arises from a want of recollection and application of these truths. If the boundaries between the animal and vegetable creations be indefinite, this must happen because the structures and functions to which these terms are rightly applied insensibly pass into and mix with each other, so as to render definition impracticable by single diagnostic cha-

racteristics, and difficult even by a careful summation of analogies and differences. When therefore zoologists define animal life to be characterised by locomotion, by sensation, or by irritability; or by a certain chemical constitution; or by certain orders of structures, as an internal digestive cavity, a nervous system, and the like,—it is not to be wondered that whole groups of undoubted animals are excluded by this inadequate method from all place in the real system of nature, and thrown into an appendix. But if, on the other hand, we recognise and act upon the principle that life manifests itself on the globe in a variety of aspects no otherwise limited than by certain general conditions, and by special adaptation to peculiar exigencies, then it will follow that all organic structures will be grouped round particular types, according to the number and importance of their agreements; these types, treated as single objects, will admit of similar arrangements; and a general classification may result, approaching to a really natural system, and justifiable on the basis of the inductive philosophy.

Considered in this manner, sponges, though they may not, as Aristotle reports, ever exhibit a shrinking movement (κίνησις) when touched,—though no polypi and no real digestive cavities are recognised in them,—must surely be admitted among zoophyta. For, in regard to their constituent structure, they are composed, as so many of the Polypiaria are, of a firm horny or stony skeleton, immersed in a soft gelatinous living mass. In respect to the aspect of these two substances, the resemblance which they offer to Alcyonia appears very strong, while their external forms, uncommonly varied, sometimes resemble Alcyonia, often approach to Palmipora, and frequently to Pavonia, Agaricia, and other forms of Lamelliferous Zoophyta. The currents of water which pass through the canals of their substance are analogous to many operations among Polypiaria and Mollusca, and perhaps depend on similar ciliary organs, though, except on the young ova of sponges, they have not yet been detected. As however they contain no Polypi, it is difficult to rank them under the Polypiaria.

It is to our countrymen Ellis and Dr. Grant that the history of sponges is most indebted. The former established the existence and nature of the currents of water which pass through the substance; and the latter, besides confirming the results of Ellis, added a vast quantity of new and valuable observations. Mr. Bowerbank has contributed precise information regarding both the fossil and recent sponges. (Ellis, 'On Corallines;' Grant, 'On Sponges,' in 'Edinburgh Phil. Journal;' Bowerbank, 'Geol. Proc., 1840; and 'Micros. Journ.,' 1841.)

Sponges are thus characterised, in accordance with the researches of Ellis and Grant, by Dr. Fleming ('British Animals,' p. 518): 'Sponges consist of an albuminous skeleton and gelatinous matter, forming a mass not irritable, with numerous holes, connected internally with anastamosing canals. The skeleton is either simple, consisting of horny fibres, as the species so commonly used for domestic purposes; or compound, being strengthened by calcareous or silicious spicula. The gelatinous matter, abounding in transparent globules, connects the different parts of the skeleton, lines the various canals, and forms the margins of the openings. The pores are minute openings (on the surface) with a gelatinous margin, strengthened or defended by the skeleton or spicula, into which the water enters in currents, generated probably by a ciliary apparatus, which however has not yet been detected by the microscope. The water, after traversing the interior canals, is ejected by means of orifices which are larger than the pores, and in many species are elevated above the surface in the form of perforated papillæ. The ova are numerous, at first appearing like groups of minute, irregularly-shaped, opaque granules, derived from the gelatinous matter, which unite into ovate bodies, falling at maturity into the canals, and are expelled by the orifices. These ova float in the water, and exhibit spontaneous motion by the rapid action of the ciliæ, which cover the anterior portion of the body, and at length attach themselves and then expand into the forms of maturity. The currents from the orifices are best examined by placing the recent animal in a shallow dish of water, and throwing a little powdered chalk on the surface, the motion of which will indicate the direction of the streams. For the purpose of examining the skeleton, it is requisite to macerate the sponge in hot water, which removes the gelatinous matter, and leaves the skeleton in a state fit to be examined under a microscope. When the spicula are siliceous, the animal matter may be removed by nitric acid, or by combustion, as was practised by Müller, when the vitreous needles will appear unaltered.'

SPO'NGIA, *Medical Uses of.* The use of sponge by surgeons, in its natural state, to absorb fluids, needs no notice, but it is also employed by them under the name of Sponge Tent, when prepared in a particular manner. This consists in dipping the sponge in melted wax, and compressing it between iron plates till it hardens on cooling; it is then cut into cylindrical or other forms. The pieces are introduced into sinuses and other narrow canals, with the intention of dilating them by the expansion of the sponge, when the wax melts by the heat of the part. Sponge Tents are however little used by modern surgeons.

When sponge has been cut into pieces, beaten in order to free it from little stones and shells, and burnt in a closed iron vessel till it is black and friable, it is then called *Burnt Sponge*, and contains a quantity of Iodine. It has been almost completely superseded in the treatment of Bronchocele and Scrophula by Iodine and its preparations.

SPONGIADÆ. Regarding sponges as Apolypiferous Zoophyta, composed of flexible or rigid skeletons enveloped in a gelatinous mass, productive of inward currents through small surface pores, and outward currents through continuous canals, we may analyse the large group of organic forms possessing these characters, by the nature and arrangement of the skeleton, for the gelatinous part (though perhaps conservable, if due care be used) is not probably capable of being examined

so as to furnish distinctive and recognisable characters.

Dr. Grant pointed out the principles of this analysis, by his observations on the nature and arrangement of the horny fibres, the calcareous and silicious spicula, and the formation and distribution of the pores and orifices of sponges. Dr. Fleming ('British Animals') gives the following genera, under the family of *Spongiadæ*:—*Tethya*, *Halichondria* (including *Spongilla* of Lamarck), *Spongia*, *Grantia*.

Blainville ('Actinologie') arranges under the head of *Amorphozoa*—*Alcyonellum*, *Spongia*, *Calcispongia*, *Halispongia*, *Spongilla*, *Geodia*, *Cœloptychium* (fossil), *Siphonia*, *Myrmecium* (fossil), *Scyphia*, *Eudea* (fossil), *Halirrhoa* (fossil), *Hippalimus* (fossil), *Cnemidium* (fossil), *Lymnorea* (fossil), *Chenendopora* (fossil), *Tragos* (fossil), *Manon* (fossil), *Ierea* (fossil), *Tethium*.

Very few of these genera, adopted from Schweigger, Goldfuss, and others, can be considered as at all sufficiently determined, because the constituent structures of the fossil masses, on which alone they can be justly founded, have, in most cases, been altogether left unexamined. When the modern achromatic microscope shall have been directed upon them, with such perseverance as Mr. Bowerbank ('Proceedings of Geol. Soc.,' 1840) has employed on the spicular structures of the sponges imbedded in or constituting the nodules of flint in chalk, so that the forms of the anastamosing fibres or stiffening spicula, the sections and distribution of the canals, &c., can be certainly defined, a great benefit will arise to this branch of zoology, and an equal advantage for geology.

SPONGIOLE, or SPONGELET, is a term applied by De Candolle to the extremities of the ultimate fibrils into which the roots of all plants are divided. It was thus named on account of the great power of absorption which this part possesses, compared with other parts of the root. It must not however be looked upon as a special organ, as upon examination the spongiole will be found to consist of merely a looser mass of cellular tissue than is found in the root above it. It is at this point that the fibrils of the root elongate by the addition of cells of cellular tissue, so that this part of the root is at once the immediate agent in the absorption of fluid from the soil and the growing point of the root. [Root.]

SPONSORS. [Baptism.]

SPOONBILL. [Herons.]

SPORA'DIC is a term applied to any disease which, being usually epidemic or contagious, occurs at any time in a few persons, without spreading extensively through a district.

SPORA'NGIUM, a term first employed by Hedwig to designate the capsule of Mosses, and since applied very generally in cryptogamic botany to that part of the reproductive apparatus which contains the spores. It is used in almost all the cryptogamic tribes synonymously with the terms *Theca*, *Capsule*, *Conceptacle*, *Folliculum*, *Involucrum*, *Sporocarpium*.

In the Ferns, the sporangia are seated in the back of the frond, forming little heaps called sori. [Sorus.] They are small brittle compressed bags, consisting of cellular membrane, and are partially surrounded by a thickened ring called the *gyrus*. By means of this ring the sporangia burst, and emit the spores which they contain. In *Ophioglossaceæ*, a small tribe of ferns, there are no sporangia.

In *Lycopodiaceæ* the sporangia are seated in the axils of a bract upon the fruit-stalk, and either burst by distinct valves or are indehiscent. In *Marsiliaceæ* the sporangia form a sporocarpium. In *Salviniaceæ* they are of two kinds: in the one kind the sporangia are composed of a thin reticulated membrane, and contain several free granules in their interior; in the other kind the granules are attached by pedicles to a central column, and are much smaller than the first.

Sporangium is not applied to the reproductive organs of Lichens, but the analogues of this organ in these plants are what are called the *Shields*, or *Apothecia*, which are filled with little tubes called *asci*, in which the sporules are contained.

SPORENDO'NEMA, a genus of plants belonging to the natural order *Fungi* and the tribe *Mucedines*. There are two species of this form of mould, the one, *S. Casei* (Red Cheese-Mould), is found on cheese, presenting little red tufts, which, under the microscope, exhibit the flocci somewhat branched and woven together. The other species, *S. Muscæ*, is called Fly-Mould, and is found on the bodies of flies in autumn. This is one of the few instances of plants being parasitic on animals. This however has been denied by some writers, who assert that the fly-mould is nothing more than a diseased secretion from the body of the fly. But Fries, Berkeley, and other cryptogamists, have recognised this mould as a plant.

SPORES. [Sporules.]

SPOROCARPIUM, a term proposed by Link, and very generally adopted by German cryptogamic botanists, to express a combination of sporangia when placed near together, and more especially when any number of sporangia are enclosed in a common membrane.

SPORULES, or SPORES, the minute organs in cryptogamic or flowerless plants from which new plants are produced, answering to the seeds in the phanerogamic or flowering plants. Although these organs perform the same office in the economy of the plant as seeds, yet they differ very essentially; and the objection that some have made to giving them a different name has been very properly disregarded by most writers on cryptogamic botany.

The situation of the sporules is exceedingly various. In the *Fungi* and *Algæ* they are frequently diffused throughout the substance of the plant, without any proper covering or receptacle. In the higher forms, as the *Mosses*, *Ferns*, *Jungermannias*, &c., they are contained in a special organ called the *Sporangium*.

The sporules of many plants exhibit a curious relation with the animal kingdom in their power of spontaneous movement. This is seen to a greater extent amongst the *Algæ* than any other, especially the group which has been called *Zoocarpeæ*. In these plants the sporules, after being discharged, assume the existence and character of

animalcules: at the end of a short time they attach themselves to some surface, commence germinating, and spend the rest of their existence as plants. 'In many of the higher *Cryptogamia* these movements are observed. In the organs called *Antheridia* of the genus *Sphagnum*, Unger and Meyen have observed a kind of spermatic animalcule resembling a *Vibrio*, which seems to be only another form of the sporules of this plant. The granular matter contained in the middle of the sporules is also endowed with motion; and when the sporule bursts, the grains are sometimes very active. The same circumstance is also observed in the pollen grains of the flowering plants.

SPOTSWOOD, JOHN, archbishop of St. Andrews, was born in 1565, in what is now the parish of Mid-Calder, in the county of Edinburgh. His father was the parson of Calder, and superintendent of Lothian, Merse, and Teviotdale (a sort of bishopric under what was thought a less odious name). Spotswood was educated at the university of Glasgow, where he is stated to have 'received his degrees' in his sixteenth year. At the age of eighteen he was appointed to take the place of his father, who was disabled by age and infirmities, as parson of Calder; and while fulfilling the duties of his office he appears to have been considered as belonging to the ultra-presbyterian party, and to have gone along with the majority in their opposition to the attempts of the government to restore episcopacy. In 1601 Spotswood was sent as chaplain to the embassy in France. While in Paris, according to Calderwood, in his 'History of the Church of Scotland,' the parson of Calder 'made no scruple to go in to mass.' For this he was delated (or indicted) at the General Assembly, and Calderwood says, 'he was *removed*, notwithstanding of the opposition of the king and some ministers; many voting that he should be suspended or deposed.' We should conjecture the word 'removed' here to be a misprint for 'reproved.'

When James set out for England, in April, 1603, Spotswood was one of five Scotch clergymen whom he appointed to attend him on his journey. On the death of James Bethune, archbishop of Glasgow, the king nominated Spotswood to that see, and he was immediately sent back to Scotland to attend the queen on her journey, and serve her for 'eleemosinar,' or almoner. He was also made a privy-councillor for Scotland.

Spotswood, as might be expected, employed his best exertions in re-edifying and strengthening the ecclesiastical system, of which he had thus been appointed one of the chief overseers. 'At his entry to the archbishopric of Glasgow,' says his biographer, 'he found the revenues of it so dilapidate, that there was not one hundred pounds sterling of yearly rent left to tempt to a new sacrilege.' In June, 1615, on the death of Archbishop Gladstanes, Spotswood was appointed to the metropolitan see of St. Andrews. He had previously, in 1609, been appointed an extraordinary lord of session, when it was proposed to restore that court to its ancient constitution of a mixed civil and ecclesiastical tribunal; but this design was abandoned the following year, on the erection of the two courts of High Commission, over one of which Spotswood was appointed to preside, and which were united under his presidency on his removal to St. Andrews.

As soon as he obtained the primacy, the writer of the 'Life' prefixed to Spotswood's 'History of the Church of Scotland' informs us, that 'he, by his favour with the king, procured three hundred pounds sterling of yearly rent (being by the sacrilege of former times swallowed up in the crown revenues) to be restored to his see; and,' continues the same authority, 'all King James his time he lived in great favour with him, and was the prime instrument used by him in several assemblies for the restoring the ancient discipline, and bringing that church to some degree of uniformity with her sister church of England. Spotswood retained the same royal favour under Charles I., whom he crowned in the Abbey Church of Holyrood, June 18, 1633. Within two years after, on the death of the Earl of Kinnoul, Spotswood was made lord high chancellor of Scotland.' He had not however attained this last height of promotion when, in 1634, he drew upon himself a storm of popular odium by his conduct in instigating the oppressive proceedings against Lord Balmerino, for the then capital crime of leasing-making (verbal sedition); and this was followed in 1637 by the ill-managed attempt to impose a liturgy on the Scottish church, which was the immediate provocation of the rebellion against the government. Spotswood however appears to have been disinclined to this innovation, though he did not openly oppose it. By recommending delay and caution he hoped to compromise matters, if not to prevent the perilous experiment altogether. But of course he shared with the rest in the destruction brought upon their whole order by its failure. Deposed from his 'pretended' office of a bishop, declared infamous, and excommunicated, by the famous Assembly which met at Glasgow, in Nov., 1638, he fled to England, where he seems to have fallen into sickness and distress, and even (as Laing says) to have resigned the seals for a pecuniary consideration; but this is doubtful. Spotswood died Nov. 26, 1639. He was buried with great pomp near Westminster Abbey. He wrote a 'History of the Church of Scotland, from the year 203 to the end of the reign of James VI.,' fol., London, 1655.

SPOUT, WATER, a meteorological phenomenon, which, at sea, is observed to take place nearly as follows:—

Below a thick cloud the sea appears to be greatly disturbed within a circular area, whose diameter varies from 100 to 120 yards, the waves tending rapidly towards the centre of the agitated mass, where there is formed a vast body of water or aqueous vapour; from hence there rises, with a spiral movement, towards the cloud, a column of a conical form resembling a trumpet. Vertically above this ascending column there is formed in the cloud, but in an inverted position, a corresponding cone, whose lower extremity (the apex of the cone) gradually approaches the summit of the ascending column; and at length both are united, the diameter at the place of junction being only two or three feet. The whole column is of a light colour near its axis, but dark along

the sides, which gives it the appearance of being hollow.

The spout appears to move with the wind, and it frequently happens that the upper and lower parts of a column move with different velocities; when, after the whole has taken an inclined position, the parts separate from one another, often with a loud report. The whole of the vapour is at length absorbed in the air, or it descends into the sea in a heavy shower of rain.

Water-spouts are occasionally seen above land, and consequently there is then no ascending column of water or vapour to meet that which descends from the clouds. In 1718 one of them burst in Lancashire, when, at the place where it fell, the ground was torn up to the extent of about half a mile in length, and to the depth of seven feet, so as to lay bare the surface of the rock underneath. ('Phil. Trans.,' No. 363.)

The formation of water-spouts has been ascribed to a whirling motion produced in the air by currents coming in opposite directions, thus causing the particles of vapour in the upper regions to acquire, by the centrifugal force, a tendency to move towards the exterior parts of the column, leaving the interior void or in a rarefied state. There is great probability that the elevation of the sea under the cloud is in part caused by the rarefaction of the air; but, from the occurrence of such phenomena at seasons when the electrical principle in the air is most active; from the sulphureous smell, the flashes of lightning, and the storms of rain or hail by which they have been accompanied, and from the destruction of trees, buildings, &c., which they have produced, their formation has been ascribed with great probability to the action of electricity.

SPRAIN, or STRAIN, is an injury of muscular or tendinous tissues, resulting from their being forcibly stretched beyond their natural length. The treatment to be adopted for sprains is the immediate application of leeches, in number proportionate to the severity of the injury and the importance of the part. They should be repeated till the pain and swelling are distinctly decreased: the part should be kept perfectly at rest and cool, and the patient's general health should be kept or made good. When the pain has nearly ceased, and there remains little more than stiffness of the injured part, stimulating liniments (the common soap liniment, or a mixture of hartshorn and oil, for example) may be used.

SPRANGER, BARTOLOMÆUS, was born at Antwerp in 1546. He commenced the study of painting in his native place, and afterwards visited Paris and Italy. At Rome he found a patron in Pope Pius V., who commissioned him to paint a picture of the Last Judgment, and appointed him his painter. In 1575 Spranger left Rome to enter the service of the Emperor Maximilian II., at Vienna. After the death of Maximilian he remained in the service of Rudolph II., who ennobled him in 1588. He died at Prague, about 1625, according to Von Mechel.

SPRAT. [CLUPEIDÆ.]

SPRAT, THOMAS, was born in 1636, at Fallaton in Devonshire. He was educated at Wadham College, Oxford, of which foundation he became fellow. He took the degree of M.A. in 1657. In 1659 he published a poem on the Death of Oliver Cromwell, and another, 'The Plague of Athens.' Having been ordained after the Restoration, he was first made chaplain to the Duke of Buckingham, whom he is said to have assisted in writing 'The Rehearsal,' and afterwards to the king. At this time he became one of the original fellows of the Royal Society, and in 1667 published its history. In 1668 he was made prebendary of Westminster, in 1683 dean of Westminster, and in 1684 bishop of Rochester. Sprat in 1685 published a history of the Rye House Plot, entitled 'A true Account and Declaration of the horrid Conspiracy against the late King, his present Majesty, and the present Government.' In the following year he was appointed one of the commissioners for ecclesiastical affairs: he voted in this office for the acquittal of the Bishop of London; and in 1688, though he had himself acknowledged the king's declaration of toleration, he refused to take part in any proceedings against the disobedient clergy. On the abdication of James, Sprat was one of those who proposed the appointment of a regent; but he did not refuse allegiance to William. In 1692 an unsuccessful attempt was made to implicate the bishop in a plot for restoring James. From this time till his death, May 30, 1713, at Bromley in Kent, he lived undisturbed by any political troubles. There is a list of his works in Wood's 'Athenæ Oxon.'

SPRENGEL, CURT, one of the most learned physicians and botanists of the last and present century, was born Aug. 3, 1766, at Bolderkow in Pomerania, where his father was a clergyman. His early studies were entirely directed by his father, and he is represented at the age of fourteen as being conversant not only with the Latin and Greek classics, and some modern languages, but to have made considerable progress in Hebrew and Arabic. Nor was his attention confined to languages, for at this age he published a little work on botany, in a series of letters, entitled 'Botany for Ladies.' In 1784 he commenced his studies at Halle, and devoted himself to both theology and medicine, but he soon gave up the former for the latter. In 1787 he took his degree in medicine, and on this occasion presented as his thesis a paper entitled 'Rudimenta Nosologiæ Dynamicæ.'

During his medical studies he kept up his acquaintance with the ancient languages, and extended his knowledge of those of the East, and was thus remarkably qualified for the study of the history of medicine. To this department he applied himself, and in 1789 was appointed extraordinary professor of medicine in the university of Halle. In 1795 he was made ordinary professor of the same department. Although his application to the study of medicine was great, and he had already commenced his work on the 'History of Medicine,' and had published his 'Manual of Pathology,' yet he found time to cultivate his acquaintance with plants, and in 1797 was appointed professor of botany. To this department

he applied the same learning that he had done to medicine, and his prolific pen has furnished the most complete history of botany extant.

Through his works he became celebrated throughout his native country, and was called upon to fill very important chairs. In 1803 he was invited to Marburg to fill the chair vacated by Baldinger; in 1809 to Dorpat; and on the death of Willdenow, in 1812, he was invited to occupy his place at Berlin. All of these he refused, and remained his whole life at Halle. The fame of his learning however was not confined to Germany; almost every country in Europe sought to confer honours upon him. Upwards of seventy learned societies and academies sent him their honorary diplomas, and many kings conferred upon him their orders of distinction. These however were objects at which he never aimed, and which he never allowed to divert him from his favourite studies. He was one of the most industrious and learned men of his age, but whilst his great learning enabled him to become perfectly conversant with what had been done by previous writers, he did not neglect to observe for himself, and add the fruit of his own experience to that which had been previously produced.

His eldest son William was professor of surgery at Greifwald, and died in 1828. This loss affected the father very severely, and he never recovered the stroke. He was attacked by several apoplectic fits, and died in one of these seizures, March 15, 1833.

Sprengel seems to have devoted the earlier part of his life chiefly to medicine; the latter part chiefly to botany; and he wrote and published some valuable works in both those sciences.

SPRING. [SEASONS, CHANGE OF, vol. x. col. 775.]

SPRING, in Mechanics, is an elastic plate or rod, which is employed as a moving-power, or a regulator of the motions of wheel-work; also to ascertain the weights of bodies, or to diminish the effects of concussion.

The elder Bernoulli was the first whose attention was directed to the curvature assumed by elastic bodies, and he succeeded in resolving the problem in the case of a rectilinear plate being fixed at one end and bent by a weight applied at the other: it being assumed as a principle that, at any point in an elastic body, the force by which the body when bent by any power endeavours to recover its previous position is proportional to the angle of contact at that point; that is, to the angle which a tangent to the curve surface of the body makes, at the point, with that surface.

The mathematical theory of the Elastic Plate may be seen in Poisson's 'Traité de Mécanique' (No. 316), and in other works. It must suffice here to observe that when such plate is fixed at one end, in a horizontal position, and a weight is applied at the opposite end, the whole deflection varies nearly with the applied weight, and with the cube of the length of the plate.

The use of a spring as a moving-power may be best exemplified in its application to watch-work. The main-spring of a watch is a thin and narrow plate of well-tempered steel, which is coiled in a spiral form: one of its extremities is attached to a pivot or axle, and the other to the interior circumference of the cylindrical box in which it is contained. In being wound, the spring closes round the axle, and afterwards, in the effort by its elasticity to recover its former position, it turns the cylinder in a contrary direction: thus the chain which is attached to the exterior circumference of the cylinder and to the fusee causes the latter to revolve.

A slender and highly-elastic spring of a like form is employed to produce a vibratory motion in the balance ring of a watch. One extremity of the spring is attached to the axle of the balance, and the other to some part of its circumference. The elastic power of the spring varies with the tension, and is directly proportional to the angle through which the spring is wound about the axle; and thus the vibrations of a spring, like those of a pendulum in a cycloidal arc, are isochronous. The length of the spring and the diameter of the balance are increased by heat and diminished by cold; consequently, without some compensating power, the times of vibration will vary according to the changes of temperature.

The use of springs in diminishing the effect of sudden changes in the motion of carriages is explained in Whewell's 'Mechanics,' art. 261 and the following.

SPRING-BALANCE, a machine in which the elasticity of a spring of tempered steel is employed as a means of measuring weight or force. One of the simplest kinds of spring-balance is the Spring Steelyard, or Pocket Steelyard. This instrument consists of a helical spring placed in the interior of a tube of brass or iron, closed at both ends; one end of the spring abutting against the plate which closes the lower end of the tube. A rod, having a hook or loop at its lower extremity, passes through a hole in the bottom of the tube, and up the inside of the spring. At the upper end of this rod is a small plate, which slides up and down like a piston in the tube, and rests upon the upper or free end of the spring; thereby causing it to collapse when a heavy body is attached to the hook at the bottom of the *sliding rod*. The extent of the motion of the spring, and consequently the weight of the body suspended from it, are indicated by the degree to which the rod is drawn out of the tube; for which purpose a graduated scale is engraved upon the rod.

Many improved varieties of spring-balance are now manufactured; and similar instruments are applied to many useful purposes besides weighing. Marriott's Patent Weighing-Machine has a spring which is a perfect ellipsis, with its longer axis laid horizontally. The stem to which the ring for holding the apparatus is attached is fastened by a nut and screw to the middle of the upper side of the spring; and the rack, with the hook which holds the article to be weighed, to the corresponding point on the lower side of the spring. The spring, rack, and pinion are inclosed in a circular box at the back of the dial-plate, the periphery of which serves as a stop to prevent the spring from being overstrained. A similar apparatus, contrived by M. Regnier, has been used as a dynamometer, as well as a weighing-machine.

SPRING, CARRIAGE. Various methods are adopted for lessening the concussion occasioned by the rolling of a wheeled carriage over a rough road. One of the simplest means is that often adopted in light carts, of suspending the seat from the sides of the body by leather straps or lashings. Next to this is the use of straps to suspend the body itself, an expedient which seems to have been occasionally resorted to from a very early period. With very few exceptions, it appears that slung or suspended carriages were not used until the 17th century. In the early carriages of this kind the straps were usually attached to a framework of wood at each end of the vehicle, rising to a considerable height above the axles. In the light carri-coche of Buenos Ayres, which is supported on two nearly straight braces or twisted cords of untanned hide, the quick vibration when on a rough road is stated to be almost as unpleasant as actual concussion. To remedy the defects of the primitive slung carriage, it was desirable to render the pillars from which the straps were suspended somewhat elastic. This could not be readily effected with wood, because the pillars were necessarily short, and therefore stiff. Hence arose the use of elastic steel supports, which have gradually assumed the form now well known as C-Springs. These were formerly used for almost all kinds of carriage-springs; but the great improvement of our roads has made way for the introduction, in all stage-coaches, and in many private carriages, of the more compact straight and elliptic springs.

Carriage-springs are usually formed of several thin plates of steel, of various lengths, so laid and fastened together that the spring shall be thick in the centre, or at the end by which it is fixed, and thin, or consisting of only a single plate, at the end or ends where the greatest play is required. The steel used is of coarse quality, and has little carbon in its composition. It is fashioned by rolling-machinery to the transverse dimensions required, which vary from one inch and a half to three inches in width, by one-eighth of an inch to half an inch in thickness. The plate forming the back of the spring is usually thicker than the rest, on account of its being the longest, and having its ends formed into bolt-eyes, to receive the bolts by which the body is connected with it.

Coach-makers apply distinct names to a great many varieties of springs. The straight spring, if single, or acting only on one side of the point at which it is fixed, is technically named the *Single-Elbow Spring*. The *Double-Elbow Spring* is a straight spring, acting on both sides of the fixed point. *Elliptic Springs*, which are usually but little curved, are used single in some carriages, between the axle and the framework. Elliptic springs are often used in pairs under the name of *Nut-Cracker Springs*, the two springs being hinged together at each end, so as to form a long pointed ellipsis. *C-Springs*, which are chiefly used in private carriages, usually consist of two-thirds of a circle, lengthened out into a tangent; the tangent being laid horizontally, and bolted down to the framework of the carriage. *Telegraph-Springs* are combinations of straight springs in sets of four. *Tilbury-Springs* are another combination of straight springs used for the two-wheeled carriage called a tilbury. *Dennet-Springs* are a combination of three straight springs, two of them placed across the axle, and attached at their fore ends to the shafts or the framing of the body, and the third placed transversely, suspended by shackles from their hinder extremities, and fastened to the body at its centre. In some carriages loops of leather or caoutchouc have been used, instead of iron shackles, for connecting straight springs, by which means the motion is rendered pleasanter, and the rattling noise of the shackles is avoided. To meet the deficiencies of the springs in common use, Mr. Adams contrived one on the principle of the bow, which will yield in any direction, and may be made capable of adjustment, by means of screws, to a light or heavy load. This spring consists of a single plate of well-tempered steel, forced into a curved form by the tension of a chord, which may be made either of prepared hempen rope, or of a riband of iron or steel, and to which the axle is attached. Springs of this sort are already much used, both on common roads and on railways; and, on the latter especially, their use is extending. Among the advantages claimed for them are their lightness and extreme elasticity, arising from the superior quality of the steel, and the absence of the friction which attends the action of the common laminated springs.

All the springs that have been alluded to in this article are *Bearing-Springs*, for supporting the weight of the body of the carriage, and of the load which it conveys. In ordinary carriages no other springs are used; but in those employed upon railways, springs are also used to impart elasticity in the direction of the line of draught, so as to render the starting and stopping of the carriages gradual and easy.

SPRINGFIELD. [ILLINOIS; MASSACHUSETTS.]

SPRINGS. Rain and snow fall in quantities so unequal in different districts, and on soils and strata which exercise upon them such various influences, that the phenomena of springs are extremely complicated and curious.

As a general rule, springs are permanent in proportion to the depth to which the water which supplies them has descended from the surface; they are perennial and almost inappreciably constant in temperature and volume, whether hot or cold, in situations where, from the arrangement of the strata, deep subterranean channels exist for the reception of rain, and particular impediments direct and contract the passages of reflux to the surface. Such cases are common in countries where jointed limestones or sandstones receive water at elevated points on the surface, and conduct it downwards below strata of clay, which are only pervious at a few points, and there permit natural discharges at lower levels than the recipient surfaces. Frequently these argillaceous strata are so nearly impervious, that artificial perforations relieve the pressure of the subterranean columns of water better than the few natural points of efflux, and thus pits and levels excavated for mines may drain springs at some distance.

On the contrary, in a country which contains narrow and frequently-mixed masses of clay and gravel, or clay and sand, which cover the solid rocks, concentrated springs are almost absent, but there is a prevalent humidity and diffused springiness along the limit of the gravelly or sandy tracts. After a continuance of dry weather such springs and wetness disappear, to be renewed after the next fall of rain.

In general the water which issues from the earth in one copious spring has been received by minute absorption on a large surface, and is almost always perennial. Between such springs and those which are merely dependent on the last shower of rain, the gradations are infinite and insensible. One of the most interesting cases of this intermediate series is that of the intermitting springs. It is a common circumstance on the chalk downs of the south of England (Wiltshire, Dorsetshire), for the valleys to be quite dry in one part of the year (autumn or winter), and very fully watered in another (spring or summer); the springs bursting higher up the valley in some years than in others, according to the quantity of rain which fell in some previous season (as the autumn), and the rate of its transmission through the jointed and absorbent chalk.

Another peculiarity of springs flowing out of cavernous limestone rocks is marked by a variable discharge: the springs now gush with vehemence, now subside, shrink away, and disappear. These ebbing and flowing wells occur in many districts, as near Dynevor in Caermarthenshire, at Tideswell in Derbyshire, and near Settle in Yorkshire. The explanation most generally received supposes the water to fill cavities underground, from which the discharging channels are siphon-formed, so that at a particular moment the full cavity begins to be discharged and finally runs out, and the current then ceases till the space be again filled to the vertex of the siphon-formed arch.

In thus descending downwards and rising upwards through various mineral masses, springs become impregnated with gaseous, saline, earthy, or metallic admixtures—as carbonic acid gas, sulphuretted hydrogen gas, nitrogen, muriate of soda, sulphate of lime, carbonate of lime, silica, carbonate of iron, &c.

SPRUCE BEER, a fermented liquor made from the leaves and small branches of the spruce-fir, with sugar or treacle. There are two kinds of spruce beer—the brown and the white—of which the latter is considered the best. In the manufacture, essence of spruce is fermented much in the same way as grape-juice in wine-making. In places where spruce-firs abound, a simple decoction of the leaves and small branches is used instead of the essence of spruce. This agreeable and wholesome beverage is useful as an anti-scorbutic.

SPRUCE-FIRS. [ABIES.]

SPURGE-LAUREL. [DAPHNE.]

SPURZHEIM, JOHANN GASPAR, was born in 1776, at Longwich, near Trier. He was educated in the university of Treves, and in 1799 went to study medicine at Vienna, where he became acquainted with Dr. Gall, the founder of the system of phrenology. Spurzheim attended Gall's lectures for four years, and then associated himself with him for the prosecution of his researches. They pursued their subject together till 1813, when they separated; Spurzheim, after taking the degree of M.D. at Vienna, came to England and continued for three years, lecturing in many of the principal towns, publishing works on phrenology, and defending it against the severe criticisms to which it had been subjected. From 1817 to 1825 he resided and lectured at Paris; and when the French government prohibited the delivery of lectures except with special permission, he returned to Britain. In 1832 he embarked for America; and a few months after his landing he died at Boston. [GALL; PHRENOLOGY.]

The scientific reputation of Spurzheim must rest chiefly on his having proved the fibrous structure of the brain, and many other very important facts in its anatomy, which, though published in his name jointly with that of Gall, were certainly due to the researches of Spurzheim alone. Nevertheless, as an originator (whether phrenology be true or not), he must stand far below Gall. His claims are of a different kind. That which Gall discovered and invented, but could scarcely have taught, was by Spurzheim made to seem intelligible; and to him must be attributed the reputation of having made phrenology popular.

The works of Spurzheim are very numerous. A complete account of them is given, with his Life, in the 'Phrenological Journal,' vol. viii. A memoir of Spurzheim was published at Dublin, in 1833, by Mr. Carmichael.

SPY. In the discussion of this and many other questions of international law, the terms Right, Law, Lawful, and others of the same class, must be understood in a different sense from their proper technical meaning. What writers on International Law speak of as a Right is very often merely what appears fair, reasonable, or expedient to be done, or to be permitted. It is this reasonableness or expediency alone which is the foundation of those various usages which are recognised by independent civilised nations in their intercourse one among another, and constitute what is called the Law of Nations. Thus a person or a power is said to have a right according to the Law of Nations, which means that the usage of civilised nations permits the act, and this is the least objectionable sense in which the word Right is used.

It is laid down that spies may be employed; and it is also laid down that if they are caught by the enemy they may be hanged; and that is their usual fate. A man of honour, Vattel observes, always declines serving as a spy, as well from his reluctance to expose himself to this chance of an ignominious death, as because, moreover, the office cannot be performed without some degree of treachery. In ordinary cases, Vattel decides, the general must be left to procure spies in the best way he can, by tempting mercenary souls by rewards.

The employment of spies is conceived to be subject to certain limitations in respect to the manner of it and the object attempted to be

gained by it. 'We may lawfully endeavour,' says Vattel, 'to weaken the enemy by all possible means, provided they do not affect the common safety of human society, as do poison and assassination.' Accordingly the proper business of a spy is merely to obtain intelligence, and such secret emissaries must not be employed to take the lives of any of the enemy, although that, done in another way, is commonly the main immediate object of the war. But it has been maintained that an officer or soldier cannot be treated as a spy in any circumstances, if he had his uniform on when apprehended.

A question closely connected with the so-called lawfulness of employing spies, is that of the lawfulness of soliciting the enemy's subjects to act as spies, or to betray him. Such measures, observes Vattel, are practised in all wars. But still he argues, they are not honourable, nor compatible with the laws of a pure conscience; an evidence of which we have in the fact that generals are never heard to boast of having practised them. It is held however to be perfectly allowable in every point of view merely to accept the offers of a traitor.

The proper question as to the so-called law of nations with regard to spies, is what practices are sanctioned by the general usage of independent civilised nations. Such practices as are now permitted by such usage constitute a part of this so-called international law. Those practices which are not generally permitted or acknowledged are not yet a part of such law. Persons who have occasion to write or think on this subject will find that much of the indistinctness and confusion observable in the treatises on the law of nations will be removed, if they will first form for themselves a clear conception of the proper meaning of the word Law, and of the improper meanings which it has also acquired; and they will thus be enabled to give the necessary precision to terms which are used so vaguely by writers on international law.

SQUADRON, the principal division (one third or one fourth) of a regiment of cavalry. The numerical strength of a squadron has varied at different times, but at present it consists of one hundred and sixty men, of whom about one-sixth are not under arms. This body of men is divided into two troops, each of which is commanded by its captain, who has under him a lieutenant and a cornet. The word is supposed to be derived from *squadra* (Italian), which is itself corrupted from the Latin word quadratum; *Acies quadrata* denoted a body of men drawn up in a square form.

SQUA'LIDÆ, a family of fishes of the section *Chondropterygii*. In this family, which includes the various species of sharks, the branchiæ are attached by their outer margin to the skin, and the water taken in for respiration makes its escape through narrow outlets corresponding in number to that of the interspaces between the branchiæ. The number of these openings is usually five. So far the present fishes agree with the Ray or Skate family (*Raiidæ*); but the peculiar rhomboidal form of the body renders it easy to distinguish the Rays, which moreover have a peculiar cartilage arising from the nasal part of the skull, and extending towards or even meeting the anterior part of the crest of the pectoral. This character is pointed out by Messrs. Müller and Henle, who state that it is found in all the Ray tribe, and also in *Rhinobatus* and *Pristis*, whereas there is no trace of it in any Shark.

In the *Sharks* the body is elongated, and tapering gradually from the head to the tail, or but little dilated in the middle; the muzzle is rounded or pointed, and depressed, and projects over the mouth; the nostrils are situated on the under side of the muzzle, in the form of oblique openings, which vary somewhat in figure, according to the species. The fins generally consist of two dorsals, two large pectorals, two ventrals, an anal fin, and a caudal, the form of which is peculiar.

The portion of the tail of the shark which supports the tail-fin is almost always bent upwards at an obtuse angle with the body: the fin itself may be divided into three parts—a superior, an apical, and an inferior portion; that which runs along the upper surface is usually narrow; that on the under surface is broader, but decreases in width to its point of junction with the apical portion, which is more or less dilated at the extremity, and obliquely truncated. Such is the most common character of the tail and tail-fin in the present fishes, and one which is not found in any recent fishes not belonging to the Chondropterygian group.

The male sharks are smaller, and differ externally from the females in possessing two elongated appendages, one of which is attached to the hinder edge of each of the ventral fins, the uses of which are not known. Some species of sharks bring forth their young alive, whilst others are enclosed in oblong semitransparent horny cases, at each extremity of which are two long tendrils. These cases are frequently found on the sea-shore, and are called sea-purses, mermaids' purses, &c.; they are deposited, observes Mr. Yarrell, by the parent shark near the shore in the winter months. The convoluted tendrils, hanging to seaweed or other fixed bodies, prevent the cases being washed away into deep water. Two elongated fissures, one at each end, allow the admission of sea-water; and the young fish ultimately escapes by an opening at the end, near which the head is situated. For a short time the young shark continues to be nourished by the vitelline fluid contained in the capsule attached to its body by the connecting pedicle, till having acquired the power of taking food by the mouth, the remains of the ovum are taken up within the abdomen, as in birds and some other animals.

A curious peculiarity has been observed in the young both of the sharks and skates during a very early stage of their existence. From each of the branchial apertures branchial filaments project externally; each filament contains a single minute reflected vessel, in which the blood is thus submitted to the action of the surrounding medium. The appendages are only temporary, and the blood of the fish is afterwards aerated by the true gills. This very interesting discovery, which, we believe, is of recent date, forcibly reminding us of

the temporal external branchiæ in the young Batrachian reptiles in the tadpole state, has been observed by Mr. Richard Owen in the Blue Shark, *Carcharias glaucus;* by Mr. John Davy, in the Torpedo; and by Dr. Allan Thompson, of Edinburgh, in the Thornback. Cuvier had previously noticed it, and, in the 'Règne Animal,' has referred to a figure, published by Schneider, of a very young shark in this condition, for which, regarding it as the normal state of the fish, that industrious pupil of Bloch had proposed the name of *Squalus ciliaris.*

The teeth of the sharks are arranged in several series, one within the other, of which the outermost row is that in use; the other rows are decumbent, and serve to replace the foremost when injured. Their form varies much in the different species; and even those of the upper and lower jaw are often very dissimilar. Though very variable however, they most commonly exhibit modifications of a triangular form, are sharply pointed, and have the lateral edges sharp and frequently serrated. It is upon the modifications observable in the form of the teeth, the form of the snout, mouth, and lips, and of the caudal fin, the existence or absence of the eyelid (*membrana nictitans*), spiracles, and of the small depression on the root of the tail, the situation of the branchial openings, and of the dorsal fins, &c., that the various divisions of the present family are formed.

The *Squalidæ* and *Raiidæ* have long occupied the attention of Professor Müller and Dr. Henle, who have conjointly published an excellent work on these groups, 'Systematische Beschreibung der Plagiostomen.' The characters of the various genera into which the sharks are divided are given by these gentlemen in the 'Mag. of Nat. Hist.' (vol. ii. pp. 33 and 88).

SQUAMA, in Botany, a scale, is a term applied to parts which, strictly speaking, are not bracts or leaves, and are arranged upon a plant in the same manner as the scales of fishes and other animals. Examples of the squama are seen in those parts of the amentum or catkin which contain the organs of reproduction, and which, if further developed, would be called bracts; also in the carpellary leaves which constitute the hardened part of the fruit of Coniferæ, the undeveloped external leaves of the buds of most plants, &c.

Squamula, the diminutive of the above term, has been applied in various senses. It is most frequently employed to designate the small internal organ which in the flower of grasses is placed nearest the seed.

SQUARE. We believe that the old English meaning of this word had reference only to the corners of a figure, or at most to right-angled corners. The old word for a square figure is a *four-square* figure; the carpenter's rule for drawing a right angle is called a T-*square* to this day. The French word équerre (anciently esquerre, originally derived, like the Italian *squadra*, from *quadratum*) is the immédiate origin; and this (in French) means also an instrument for drawing a right angle. In Recorde's 'Ground of Arts,' the earliest English geometry extant, he calls what is now a square by the name of *square quadrate* (*squlare*, right-angled; *quadrate*, four-sided figure); and it is not until he is considerably advanced in his work that he seems to find out that he may drop the second word, and retain the first only. There was still an incorrectness, for a square figure should have meant one having all its angles right angles; that is, what we now call a rectangle, whether its sides were equal or not. To complete the proof of connection between the square and the right-angled corner, we may mention that before now a right-angled *triangle* has been called a *square*. In or about 1613, Thomas Bedwell published a work, of which the title was '*Trigonum* Architectonicum, the Carpenter's Square.'

In geometry, a square means a four-sided plane figure with all its sides equal, and all its angles right angles. In algebra, it signifies the number produced by multiplying a number by itself. The reason of the double meaning is obvious enough. A square of seven units long contains 7×7 square units; so that the operation 7×7 is the arithmetic of finding the content of a square of 7 units in length and 7 in breadth.

A square is divided by its diagonal into two isosceles right-angled triangles: its diagonals are equal, and bisect each other at right angles.

SQUARE ROOT, the name given to a number with reference to its square. Thus, 49 being the square of 7, 7 is the square root of 49. When an integer has no integer square root, it has no square root at all in finite terms: thus 2 has no square root. But since 1.4142136 multiplied by itself gives very nearly 2, or has a square very near to 2, it is customary to say that 1.4142136 is very nearly the square root of 2: more properly, the square root of something very near 2.

SQUATI'NA, a genus of cartilaginous fishes, of which the Angel or Devil Fish of our seas is the type. They differ from all the other sharks in the position of the mouth, which is cleft at the extremity of the snout, and not placed below, and in the position of the eyes, which, instead of being on the sides, are on the summit of the flattened head. The body is broad, and flattened horizontally; the head is round. The dorsal fins are placed farther back than the ventrals, and there is no anal fin. [SQUALIDÆ.]

SQUILL. [SCILLA.]

SQUILLA, the name of a genus of plants belonging to the natural order *Liliaceæ*. *S. maritima*, the Maritime Squill, is a native of the coasts of the Mediterranean, and is the Skilla of Dioscórides. *S. Pancration* is a smaller plant than the last. According to Steinheil, this is the Pancration of Dioscorides, which acted much more mildly as a medicinal agent than the former species, with which, by most writers, this plant has been confounded. [SCILLA.]

SQUINTING (*Strabismus*). It is a condition essential to correct vision that the axes of both eyes correspond in direction, and be turned simultaneously towards the object we regard. Now to ensure the fulfilment of this condition, the orbital muscles (motores oculorum) are so supplied with nervous influence that we cannot will the movement of one eye without the other being called

into involuntary and harmonious action. There are some individuals however whose optic axes are not parallel, and whose eyes do not move in harmony with each other; such persons are said to squint, or to be affected with strabismus. Squinting may take place either upwards, downwards, inwards, or outwards, or in the intermediate directions; it may also be confined to one eye, or it may affect both.

Causes.—Among the remote causes which unquestionably contribute to this effect, may be enumerated convulsions, teething, the irritation arising from worms, ophthalmia, imitation, a habit of misdirecting the eyes, as by frequently looking at a mole on the nose, &c. The proximate cause resides in some affection of the muscles or nerves of the eyeball; either the balance of power between the former is lost, or the sympathy which exists naturally between the motor-oculi nerves of the two eyes is impaired.

Treatment.—This must depend upon whether the affection is of a temporary or permanent nature; in the former case it will be found to arise from some local irritation, and can be removed by suitable therapeutic remedies; in the latter, an operation will generally be required. Among the different other plans of treatment which occasionally have proved successful, we may enumerate binding up the sound eye; the employment of spectacles having glasses of different power; blinders projecting in front of the temples, with a view of attracting the eyes outwards; electricity, &c. The operation for the cure of strabismus is said to have suggested itself first to Dr. Stromeyer, from witnessing the success of tenotomy in contractions of the limbs. Dr. Dieffenbach of Berlin however was the first who had the boldness to carry it into practice on the living subject. The operation consists in dividing the muscle by which the distortion is produced, and thus allowing its antagonist to draw the eye again into the centre of the orbit.

SQUIRRELS, SCIURIDÆ, an extensive and interesting group of Rodents, spread over Europe, Asia, Africa, and America. None are found in Australia.

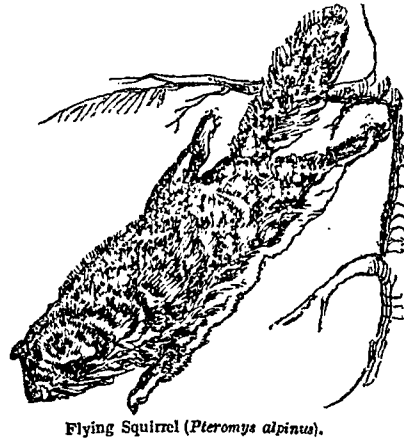
The general characters of the Tree Squirrels (*Sciurus*), as exhibited by our well-known British species, are familiar to all: its fine full eyes, its elegant contour, its activity, its deep soft fur, and long bushy tail, the hairs being disposed laterally, have contributed to render it a general favourite. These animals are furnished with proper clavicles, and possess the use of the forearm and paws in a high degree of perfection. The anterior toes are four, with the rudiment of a thumb on the anterior feet; the posterior, five. The claws are sharp and hooked. Ears often tufted with a pencil of long hairs.

$$\text{Incisors, } \frac{2}{2}\text{ ; Molars, } \frac{5-5}{4-4} = 22.$$

In feeding, these animals sit up on their haunches, and hold the food (nuts, &c.), not between the fingers of their joined forepaws, but between their rudimentary thumbs, while they work at it with their teeth.

This group may be divided into Ground Squirrels (*Tamias*), Flying Squirrels with lateral parachutes (*Pteromys, Sciuropterus*, &c.), and Tree Squirrels (*Sciurus*, &c.)

The Flying Squirrel (*Pteromys alpinus*) is a native of the Rocky Mountains of North America, where it lives in dense pine-forests. Length, about 14 inches, of which the tail measures 6.



Flying Squirrel (*Pteromys alpinus*).

For the account of a very singular Flying Squirrel from Fernando Po (*Anomalurus Fraseri*, Waterh.), see 'Proceeds. Zool. Soc.' 1842, p. 124, also Fraser's 'Zoologica Typica.' See besides, Waterhouse in 'Proceed. Zool. Soc.,' 1839, p. 172. He regards the *Sciuridæ* as consisting of the following genera, *Sciurus, Pteromys, Tamias, Spermophilus, Arctomys*, and *Aplodontia*, to which *Anomalurus* must be added. [RODENTIA.]

Fossil Squirrels.—Fossil squirrels (*Sciurus*) occur in the Eocene period of the tertiary series of strata (first lacustrine period). They have been found in the gypsum quarries in the neighbourhood of Paris.

SRINAGHUR. [SERINAGHUR.]

STA'AVIA, a genus of plants of the natural family of *Bruniaceæ*, which was so named by Thunberg after Staaf, one of the botanical correspondents of Linnæus. The genus consists of several small shrubs, which are indigenous at the Cape of Good Hope, and are remarkable for their flowers being arranged in heads resembling those of some of the *Compositæ*.

STABLE AND UNSTABLE; STABILITY. A system is said to be stable when a slight disturbance of its actual condition would not produce a continually increasing effect, but one which finally ceases to increase, diminishes, becomes an effect of a contrary character, and so on, in an oscillatory manner. The ordinary vibration of a pendulum is an instance; the oscillation takes place about a stable position of equilibrium. We can give no instance of an unstable position; for, by definition, such a thing is a mathematical fiction. Any disturbance, however slight, produces upon an unstable system an effect which con-

tinually increases; no unstable equilibrium therefore can exist a moment, for no system made by human hands can be placed with mathematical exactness in a given position. The pendulum of which we have just been speaking has a position of equilibrium exactly opposite to that about which it can oscillate, but no nicety of adjustment will retain it in that position: it may appear to rest for a moment, but will almost instantly begin to fall.

When a system is supported on three or more points, it is well known that there is no equilibrium unless the vertical passing through the centre of gravity cuts the polygon formed by joining these points. This must not be confounded, as is sometimes done, with a case of distinction between stable and unstable equilibrium; for it is a case of equilibrium or no equilibrium, according as the central vertical cuts or does not cut the base of the figure. Of course it is in the power of any one to say that stability means equilibration and instability non-equilibration; but such is not the technical use of these words in mechanics: stability and instability refer to equilibrium, stable equilibrium being that which would only be converted into oscillation by a disturbance, and unstable equilibrium that which would not be so converted.

Neither must the effects of friction or other resistances be confounded with those of a stable or unstable disposition. A ladder resting against horizontal ground and a vertical wall is maintained by friction; were it not for friction, there would not be rest in any position; and as it is, the angle which the ladder makes with the ground must not be too small. There is thus a set of positions, from the vertical one to a certain inclination, depending on the amount of friction, in all of which there is equilibrium; while in every other position there is no equilibrium. Again, when a bar rests on two inclined planes, without friction, there is a position of equilibrium which is really unstable: any displacement would throw the bar against one of the planes without any restoration.

STACHYS, the name of a genus of plants belonging to the natural order *Lamiaceæ*, or *Labiatæ*. The species are very numerous, above 100 being enumerated. They are herbs or undershrubs, with their flowers arranged in whorls. The majority of them are European plants.

S. betonica, Common Betony, is very plentiful in Great Britain. It was formerly much used in medicine, and is now a popular remedy for some complaints. When taken fresh it is said to possess intoxicating properties. The leaves have a rough bitter taste, and are slightly aromatic. The roots are nauseous and very bitter, and when taken act as purgatives and emetics. *S. lanata*, Woolly Woundwort, is a native of Europe, in the neighbourhood of the Mediterranean. This plant is remarkable for its woolly covering, as well as the *S. Germanica* (German Woundwort), on which account they have been introduced into our gardens. Many other species are covered with hairs so as to give them a powdery-looking woolly character, as the *S. alpina*, *S. Italica*, &c. *S. palustris*, Marsh-Woundwort, or Clown's All-Heal, has pale purple flowers, with a variegated lower lip of the corolla. This plant is a native of Europe, Asia, and North America. It is abundant in watery places, by road sides, in meadows, and corn-fields in Great Britain. It is called Clown's All-Heal by Gerard. The young shoots and the roots also, when cooked, form an excellent esculent. On the farm it is a weed that should be well looked after, as it exhausts the soil and increases very rapidly.

STACHYTARPHA, the name of a genus of plants belonging to the natural order *Verbenaceæ*. The species are natives of South America and the West India Islands. Many of them have been described as Vervains, but they are distinct from that genus. They are herbaceous or shrubby, and many of them are handsome plants. *S. Jamaicensis*, Jamaica Bastard Vervain, is a native of the West India Islands, and has there a reputation something like that which distinguished our common Vervain.

STACKHOUSE, THOMAS, was born in 1681. Scarcely anything is known of him with certainty, except that he was curate at Richmond, at Ealing, and at Finchley; that the vicarage of Benham in Berkshire was given him in 1733; and that he died there in 1752.

His first publication was 'A Letter to a Right Reverend Prelate' in 1722. In the next year he published 'Memoirs of Bishop Atterbury,' and in 1729 appeared his 'Complete Body of Divinity,' in a folio volume. In 1732 he was engaged in a dispute with a bookseller, for whom he had engaged to write a work, entitled 'A History of the Bible.' The work appeared, and forms two volumes in folio. In 1747 he published in folio 'A New and Practical Exposition of the Apostles' Creed.' There are other published writings of his not here particularly named.

STACKHOUSE, JOHN, was the nephew of Thomas Stackhouse. He studied at Oxford, and was made a fellow of Exeter College, but he resigned his fellowship in 1763. He employed the leisure which an independent fortune gave him in the pursuit of botany. He was one of the earliest fellows of the Linnean Society. His attention was principally directed to the study of Algæ. In 1801 he published his 'Nereis Britannica' in folio, a work containing descriptions in Latin and English of the Fuci, Algæ, and Confervæ growing in England, and illustrated with coloured plates. In 1814 he published an edition of Theophrastus 'On Plants,' in two volumes, which was illustrated with plates, and contained a catalogue of the plants of Theophrastus, with a copious glossary and many valuable notes. In 1811 he published 'Illustrationes Theophrasti,' in which the plants of that author are arranged according to the Linnæan system, and the modern synonyms are given. He died at Bath, in Nov. 1819.

STACKHOUSIA, a small order of plants belonging to the syncarpous group of polypetalous Exogens. All the species are natives of Australia. The only genus of the order at present is *Stackhousia*, which was named in honour of John Stackhouse.

STADE, the capital of the Province of Bremen,

formerly the Duchy of Bremen, in the kingdom of Hanover, is in 55° 36′ N. lat., and 9° 24′ E long., 22 miles W. by N. from the city of Hamburg. It is situated in a marshy country on the banks of the Schwinge, which is navigable at high-water, and falls into the Elbe about three miles below the town. Stade was formerly strongly fortified, but the works were blown up at the end of the 18th century. They have however since been repaired. Among the public buildings are three churches, a town-hall, and a gymnasium. The town, with the suburbs, contains about 6000 inhabitants, who have manufactures of flannel, worsted stockings, hats, and lace.

At the village of Brunshausen, where the Schwinge falls into the Elbe, there is a fort with a garrison, called the Schwinger Schanze, off which a royal guard-ship is constantly stationed, for the purpose of collecting the duties levied by the Hanoverian government on vessels or merchandise passing up or down the Elbe. The *Stade Duties*, or *Brunshausen Tolls*, as they are now more commonly called, were originally regulated by a treaty in 1691, and were light, but have been gradually increased, till they produce about 40,000*l.* a-year.

By a convention between the King of Hanover and the other Elbe-bordering states, dated April 13, 1844, these duties were revised and settled according to a toll-tariff agreed upon. The commercial intercourse between Great Britain and Hanover, including the Stade Duties, is regulated by a treaty between Queen Victoria and the King of Hanover, dated July 22, 1844, which is to continue in force till Jan. 1, 1854.

STA'DIUM (ὁ στάδιος and τὸ στάδιον), the principal Greek measure of length, was equal to 600 Greek feet or 625 Roman feet, that is, to 606 feet 9 inches English. The Roman mile contained 8 stadia. The Roman writers often measure by stadia, chiefly in geographical and astronomical measurements.

The standard length of this measure was the distance between the pillars at the two ends of the foot-race course at Olympia, which was itself called *stadium*, from its length, and this standard prevailed throughout Greece. Some writers have attempted to show that there were other stadia in use in Greece besides the Olympic.

The common Greek method of reckoning distances, both by sea and land, was by computation, not by measurement. A journey or voyage took a certain number of days, and this number was reduced to stadia by allowing a certain number of stadia to each day's journey. The number of stadia so allowed was computed on the supposition that circumstances were favourable to the traveller's progress; and therefore every impediment, such as wind, tide, currents, windings of the coast, a heavily-laden or badly-sailing ship, or any deviation from the shortest track by sea, and the corresponding hindrances by land, would all tend to increase the number of days which the journey took, and consequently the number of stadia which the distance was computed to contain. These circumstances, together with the fact that the Greek writers are by no means agreed as to the number of stadia contained in a day's journey, and other sources of inaccuracy which we know to have existed, furnish a satisfactory explanation of the discrepancies which we find in their statements of distances, both when compared with one another, and when compared with the actual fact, without there being any occasion to resort to the supposition of a stade different from the Olympic.

When we come however to writers as late as the third century of the Christian æra, we do find stadia of different lengths. Of these the chief are those of 7 and 7½ to the Roman mile. (Wurm, 'De Ponderibus,' &c., s. 58.)

The following table, from the Appendix to Hussey's 'Ancient Weights and Money,' represents the supposed varieties of the Greek stadium:—

	Yds.	Ft.	Inch.
Stade assigned to Aristotle's measurement of the earth's surface	109	1	2.26992
Mean geographical stade, computed by Major Rennell	168	1	6
Olympic Stade	202	0	9
Stade of 7½ to the Roman mile	215	2	2.4
Stade of 7 to the Roman mile	231	0	5.124

The race-course for foot-races at Olympia was called Stadium, as above mentioned, and the same name was applied to all other such courses. There still exist considerable ruins of stadia: among the most remarkable of which are those at Delphi, Athens, Messéne, Ephesus, and Laodicéa.

STADTHOLDER (*Statthalter* in German, *Stadhouder* in Dutch) means lieutenant or governor. The appellative Statthalter is used in the cantons of German Switzerland to denote the civil officer who is next to the landamman or chief magistrate. In the federal republic of the Seven United Provinces of the Netherlands, the stadhouder was himself the first magistrate or president of the Union. When several of the towns of Holland revolted against the tyranny of the Duke of Alba, the lieutenant of King Philip of Spain, they chose for their governor William, prince of Orange, swearing allegiance to him as the king's stadhouder. But it was not until after the death of William, in 1584, that the three united provinces of Holland, Zealand, and Utrecht agreed to have one stadhouder in common, and appointed to that office Maurice of Nassau, son of the deceased William. From that time the stadhoudership continued in the house of Nassau till the death of William III. in 1702, when the office became vacant. But in 1747, after a struggle between the republican and the Orange parties, the latter proclaimed William IV. hereditary stadhouder of the Seven United Provinces. His son William V. was expelled by the French in 1795, and resigned the stadhoudership by treaty with France in 1802, since which the office has not been revived, the republic of the Netherlands having been transformed into a kingdom. [NETHERLANDS.]

STAEL, ANNE GERMAINE DE, born at Paris in 1768, was the only child of Necker, the

minister of finance to Louis XVI.' She applied herself to literary composition at an early age. In 1788 she published 'Lettres sur les Ouvrages et le Caractère de J. J. Rousseau.' About this time she was married to the Baron of Stael Holstein, the Swedish ambassador at Paris, who was much older than herself. When the French Revolution broke out, and her parents had retired to Switzerland, the baron's diplomatic character was a protection to his household, and Madame de Stael remained at Paris through the first storms of that period. Her imagination was at first captivated by the prospects of a revolution which promised the reform of abuses, but her generous nature soon shrunk from its atrocities. She even ventured to publish a defence of the Queen Marie Antoinette, then upon her trial, 'Réflexions sur le Procès de la Reine,' August, 1793. But the triumph of the terrorists drove her at last out of Paris. After their fall Madame de Stael returned, and became the leader of a distinguished circle of literary men and politicians. After the establishment of the military dictatorship of Bonaparte, whom Madame de Stael seems to have disliked from the first, her salon became the opposition club of the time. She was supposed to have encouraged her father to publish his last work, 'Dernières Vues de Politique et de Finance,' in which he descanted against the government of a single man; the work was forbidden in France; and Bonaparte, then first consul, sent Madame de Stael an order to quit Paris. She went to Switzerland, and then travelled through Italy, where she gathered materials for her 'Corinne.' Madame de Stael had already published a novel in 1803, entitled 'Delphine.' After the publication of this work, Madame de Stael proceeded to Germany, and gathered the materials for her work 'De l'Allemagne,' in which she described the feelings, the literature, and the habits of the German people. This work was printed at Paris in 1810. The MS. was submitted to the censors, according to the existing laws, and after several passages had been expunged, the publication was authorised; 10,000 copies were struck off, when suddenly the whole stock was seized at the publisher's by Napoleon's minister of police, and suppressed. Madame de Stael, who was staying at Blois, retired to Coppet in Switzerland, whence she remonstrated without effect against this arbitrary proceeding. The work was first published at London in 1813.

Madame de Stael remained for a time at Coppet, closely watched, even on Swiss ground, by the French police. At last she contrived to escape from thraldom, and went to Russia on her way to England. She has given an account of her wanderings and the petty persecution to which she was subject, in her 'Dix Années d'Exil.' In 1814, after Napoleon's abdication, Madame de Stael returned to Paris, where she, Benjamin Constant, and her other old friends, belonged to what was called the constitutional party. After Napoleon's return from Elba, Madame de Stael as well as Benjamin Constant, appeared reconciled to his government, thinking that he must now accommodate himself to a constitutional system. After his second fall, she returned to Switzerland, and seemed to have weaned herself from active politics. She occupied herself with preparing her last work for the press, 'Considérations sur la Révolution Française,' published after her death, which took place July 14, 1817. Madame de Stael wrote several other works: 'On the Influence of the Passions,' 'Reflections on Suicide,' &c. Her works have been collected and published in 17 vols. 8vo., Paris, 1830.

STAFF, MILITARY. In the British empire this consists, under the king or queen, and the general commanding-in-chief, of those general, field, and regimental officers to whom is confided the care of providing the means of rendering the military force of the nation efficient, of maintaining discipline in the army, and regulating the duties in every branch of the service.

Besides the commander-in-chief, his military secretaries, and aides-de-camp, the general staff consists of the adjutant and quartermaster-generals, with their respective deputies, assistants, and deputy-assistants; the director-general of the medical department, and chaplain-general of the forces. The staff of the ordnance department consists of the master-general and lieutenant-general, with their deputies and assistants; the inspector of fortifications, and the director of the engineers. The head-quarters for the general staff are in London. There are also, for the several military districts into which Great Britain and Ireland are divided, inspecting field-officers, assistant adjutants-general, and majors of brigade, together with the officers attached to the recruiting service. Lastly, in each of the colonies there is a staff graduated in accordance with the general staff of the army.

The adjutant-general of the army is charged with the duty of recruiting, clothing, and arming the troops, superintending their discipline, granting leave of absence, and discharging the men when the period of their service is expired. To the quartermaster-general is confided the duty of regulating the marches of the troops, providing the supplies of provisions, and assigning the quarters or places of encampment.

The staff of a regiment consists of the adjutant, quartermaster, paymaster, chaplain, and surgeon.

About the year 1800 the British government first formed a particular school for the purpose of instructing officers in the art of surveying ground in connection with that part of tactics which relates to the choice of routes and of advantageous positions for troops. These officers were first employed in Egypt, where they rendered considerable service; and the school was afterwards united to the Royal Military College, which had been then recently instituted for the instruction of cadets who were to serve in the cavalry or the infantry of the line. At that institution a limited number of officers, under the name of the senior department, continue to be instructed in the duties of the staff, and in the sciences connected with the military art. The duties of officers belonging to the quartermaster-general's staff are explained under Reconnoissance. [RECONNOISSANCE.]

STAFFA. This small island, lying west of the larger trap masses of the island of Mull, on

the western side of Scotland, is entirely composed of amorphous and pillared basalt: the pillars have in many parts of the rugged coast yielded to the action of the sea, and permitted the formation of caves, some of them uncommonly picturesque, which are generally arched over by what seems to be amorphous trap rock, but really is often prismatised in an irregular manner.

The section of the pillars is rarely triangular or quadrangular, generally pentagonal or hexagonal. Some of them are 2 feet in diameter, others as small as 1 foot, 9 inches, or even 6 inches. They are less regularly jointed than those of the Giant's Causeway on the north coast of Ireland.

Skirting in a boat the coast of Staffa, the frequent caves and ranges of pillars, some erect and some curved beneath a huge entablature of rock, and the regular pavement formed by the angular sections of the pillars, astonish the spectator. The largest of the caves is Fingal's Cave, which may be entered on foot, on the south side, along a rugged pavement of pillar-tops. Looking out from near the extremity, the eye is delighted with the bright prospect of Iona, through the long dark vista of the cave; above, the roof is formed partly of pillar-sections, and partly of the already mentioned amorphous trap; the sides are straight vertical prisms of basalt, washed at their base by a deep and often tumultuous sea. The entire length of the cave is 371 feet; the greatest breadth is 53 feet; the height of the arch at the mouth is 117 feet, at the end 70 feet; depth of water at the bottom, 9 feet.

STAFFORD. · [STAFFORDSHIRE.]

STAFFORDSHIRE, a midland county of England, is bounded N.E. by Derbyshire, E. by Leicestershire, S.E. by Warwickshire, S. by Worcestershire, S.W. and W. by Shropshire, and N.W. by Cheshire. The greatest length N. to S. is 60 miles; the greatest breadth E. to W. is 38 miles. A portion of Worcestershire, including the town of Dudley, is entirely insulated by Staffordshire, and a detached portion of Staffordshire is entirely surrounded by Worcestershire. The area is 1184 square miles. The population in 1841 was 510,504.

Surface and Geology.—The northern is the highest part of the county. It consists chiefly of wild moorlands, formed by long ridges extending from N.W. to S.E., separated from each other by deep dells or by valleys watered by the tributaries of the Trent, and gradually subsiding towards the banks of that river. The highest summits have an elevation of about 1200 feet above the sea. On the eastern side of the county are the high grounds of Needwood Forest; and south of the Trent, toward the centre of the county, between Stafford and Lichfield, are the high grounds of Cannock Chase. On the S.E. border, between Dudley and Hales Owen are the Rowley Hills, which reach an elevation of 900 feet.

The western side of the county is occupied by a tract of high ground, which separates the streams which flow westward by the Severn into the Atlantic from those which flow eastward by the Trent and the Humber into the North Sea. Ashley Heath, on this range of high land, has an elevation of 800 feet.

The lowest spots in the county are probably near the bank of the Severn, at the S.W. extremity of the county, and the bank of the Trent, at the junction of the Dove, on the eastern border. These are 60 feet and 100 feet respectively above the level of the tide of the Thames at Brentford.

Nearly the whole of the county is included in the great red-marl or new red sandstone district of central England. The northern part is indeed beyond the limit of this formation; and there are some insulated districts occupied by the coal-measures or other subjacent formations, which rise through the red-marl. The higher grounds of Needwood Forest and Cannock Chase, as well as those which separate the basin of the Trent from that of the Severn, consist of the red-marl formation. Gypsum is quarried in Needwood Forest and in the adjacent part of the valley of the Dove. The pure white gypsum, or that slightly streaked with red, yields plaster of Paris, which it much used in The Potteries for moulds.

The Dudley or South Staffordshire coal-field extends from Cannock Chase to the Worcestershire border near Stourbridge, about 20 miles in length N. by E. to S. by W.; and from King's Swinford to Soho, near Birmingham, 10 miles W. to E. The dimensions indeed include not only the coal-field itself, but the Rowley Hills, which are composed of transition and other rocks, by which it is intersected. The coal measures rest immediately on a transition rock. The hills S.E. of Dudley consist of one mass of basalt and amygdaloid, round which the coal-measures do not crop out, but preserve their usual level in approaching it. The basalt is very pure, and is locally termed Rowley Rag. It is quarried for mending the roads and paving the streets of Birmingham. Trap rock is found in that part of the coal-field near Walsall: it is apparently part of a thick vertical greenstone dyke. The coal of the southern part of the Dudley field is distinguished by the occurrence of an extensive bed called the Main-Coal, 30 feet thick. In the northern part of the field seams of coal are found four, six, and eight feet thick, which appear to be subjacent to the main coal.

In the northern part of the county another coal-field (the Pottery coal-field) occurs, of triangular form. It extends from Lane-End in The Potteries to Congleton in Cheshire, where is the vertex of the triangle, 13 miles in length from S. by E. to N. by W. Its greatest breadth, which is in the southern part, forming the base of the triangle, is 8 or 10 miles. A short distance to the east of this is the Cheadle coal-field, the town of Cheadle lying near its S.W. border. This small coal-field appears to be an insulated basin, the strata dipping towards Cheadle as a centre, and resting upon millstone grit. The Pottery coal-field also appears to be an insulated basin. There are 32 beds of coal in this field, generally from 3 to 10 feet thick.

A prolongation of the South Lancashire coal-field extends into the northern part of the county about Flash, where there are several coal-works. The Warwickshire coal-field just touches the border near Tamworth.

The coal-works of the county are very nu-

merous and important. In the south they supply the iron and other hardware manufactures of Birmingham, Dudley, Wolverhampton, Wednesbury, Bilston, Walsall, &c.; and in the north they supply the fuel to the Pottery district. Perhaps the neighbourhood of Birmingham is the cheapest district for coals in England, and the consumption is prodigious. Ironstone is abundant in the Dudley coal-field.

The high moorlands of the northern part of the county consist partly of millstone grit and shale; partly of carboniferous or mountain limestone.

Rivers, &c.—The county belongs almost entirely to the basin of the Humber. The Trent, the most important tributary of that æstuary, rises from three springs near the N.W. border of the county, near Knypersley Hall, and runs S. through The Potteries 12 miles to Trentham Park. Thence it runs 18 miles S.E. by Stone and Rugeley, being joined above the latter by the river Sow. From Rugeley the Trent bends E. 10 miles to the junction of the Tame and the Mease, and then turning N.E. runs 8 miles to Burton, where it becomes navigable; and 2 or 3 miles below Burton quits the county altogether. Its whole length in the county or upon the border is about 50 miles.

The principal tributaries of the Trent are the Lyme from Newcastle-under-Lyme, the Sow, the Blyth, the Tame, the Mease, and the Dove. The Lyme joins the Trent on the right bank, not far from its source. The Mease has only a part of its course on the border of the county. The Sow rises 5 or 6 miles N.W. from Eccleshall, near the western border of the county, and flowing to that town and through the town of Stafford, receives the Penk which rises a little to the N.W. of Wolverhampton, and flows 20 miles N. through Penkridge into the Sow. From the junction of the Penk the Sow flows E. 4 miles into the Trent, which it joins on the right bank. Its whole course is about 20 miles: it is not navigable. The Blyth rises about 4 miles E. from Hanley in The Potteries, and flows S.S.E. 23 or 24 miles into the Trent, which it joins 5 miles below Rugeley. The Tame rises 4 miles N.W. from Walsall, and flows 15 miles S.E., passing between Walsall and Wednesbury to Aston, a suburb of Birmingham, where it receives the brook Rea, which flows through Birmingham itself. From the junction of the Rea the Tame flows E. and then N. through Warwickshire about 19 miles, by Tamworth, where it receives the Anker, into the Trent. The whole course of the Tame is about 42 miles. The Dove rises near the northern extremity of the county, and flows S.S.E. by Longnor, Ashbourn (Derbyshire), and Uttoxeter, into the Trent, below Burton, dividing through nearly its whole course the counties of Derby and Stafford: its length is nearly 45 miles. It is not navigable. The upper part of its course is through the beautiful scenery of Dovedale on the border of the Peak.

The western border of the county belongs to the basin of the Severn, which flows for about 2 miles across the south-western corner of the county. About 14 miles of the course of the Stour are on or within the southern border of the county, to which its tributary, the Smestow, which rises near Wolverhampton, wholly belongs.

The canals of this county are numerous. The most important is the Trent and Mersey Canal, or, as it is sometimes called, the Grand Trunk Canal. This canal, commencing in the Trent at the junction of the Derwent in Derbyshire, enters the county near the junction of the Trent and Dove, and follows the valley of the Trent through the heart of the county, to Stoke in The Potteries, whence it continues its course to the Mersey, at Runcorn Gap. About 50 miles of its course belong to Staffordshire. It passes near Burton-upon-Trent, where there is a cut to the Trent, Rugeley, Stone, Stoke, Hanley, Burslem, and Tunstall. The Birmingham Canal and the Birmingham and Liverpool Junction Canal may be regarded as forming another important line, entering the county near Birmingham, and passing through the iron and coal district, by Dudley and Wolverhampton, and then running N.W. into Shropshire. The length of this line may be estimated at about 32 miles. These two main lines of canal navigation belong to the county at large. There are several smaller lines which belong to the coal and iron districts of South Staffordshire.

There are several railways in the county. The London and North-Western Railway runs through the middle of the county; the Staffordshire Railway passes through the Pottery district; and other lines extend to all the principal towns.

Agriculture.—The air of this county is sharp in comparison with those which are situated to the south of it, and at the same time the county is more subject to continued rains, which make the crops later and the harvest more precarious. The quantity of rain which falls in the neighbourhood of London during the year is equal to about 20 inches on an average, but in Staffordshire the average is about 36 inches. From this it is apparent that the heavy soils, and those which are situated on impervious subsoils, require very complete draining before they can be made productive, whatever may be the natural fertility of the surface. The western parts of England are in general more rainy than the eastern; and in this respect Staffordshire must be reckoned with the former. One cause of this are the high lands which traverse the country, and arrest the vapours which blow from the Atlantic. The middle and southern portions of the county are comparatively flat, and have only gently undulating hills. This portion also contains the most fertile lands, and is in the best state of cultivation.

The proportion of the arable land to the pasture is nearly as five to one in this county. On the first, two-fifths consist of clays and heavy loams; two-fifths of gravelly and sandy loams, and one-fifth of light gravel and sand, chiefly good turnip land, but not so productive for wheat. The Trent traverses a great portion of the county, and receives the tributary streams of the Dove, which is noted for its fertile banks. It also receives the waters of numerous other streams. The Severn touches the southern part of the county, and receives the waters of the Stour and Smestow. There are rich meadows on the banks of all these streams.

There is not much land devoted to the grazing of cattle, or to extensive dairies, but many fine beasts are fatted in stalls. The breed most esteemed is that of the short-horns, and few others are to be met with on the principal farms. The original Staffordshire sheep has been either superseded by more useful breeds, or has been changed and improved by crossing. Every breed is to be met with which is in any repute. The farm-horses in Staffordshire are active and strong, and in general well kept. The Staffordshire hog of the old breed is coarser than the Berkshire or Essex, but much pains have been taken to introduce better pigs, and with considerable success.

Divisions and Towns.—Staffordshire is divided into 5 hundreds. It is in the diocese of Lichfield, and constitutes the archdeaconry of Stafford. It is in the Oxford Circuit, and the assizes are held at Stafford. For parliamentary purposes it is divided into North Staffordshire and South Staffordshire, each of which returns 2 members to parliament; in addition to which, Lichfield, Newcastle-under-Lyme, Stafford, Stoke, Tamworth, and Wolverhampton, return each 2 members, and Walsall returns 1 member: total, 17 members.

The following are the principal towns, with the population of each in 1841:—

Bilston, a market-town, 2 miles S.E. from Wolverhampton, is included in the parliamentary borough of Wolverhampton. The town extends about 2 miles on the great road from London through to Holyhead. The road from Birmingham to Manchester, Liverpool, and Chester also passes through it, and the Birmingham and Staffordshire Canal passes near it. It has thus great facilities for transmitting the heavy products of its mines and foundries to different parts of the country. The town is irregularly built, but has a fair proportion of good and substantial houses in its principal streets. There are numerous furnaces for smelting iron-ore, with foundries, forges, slitting-mills, and the various works necessary for the preparation of iron. Manufactures in iron, from nails and wire to the heaviest articles, are largely carried on, and also manufactures in tin, japanned ware, and coarse pottery. The town contains two churches and several places of worship for dissenters. It is a chapelry in the parish of Wolverhampton. Population of the township and chapelry, 20,181.

Brewood, a village, formerly a market-town, 10½ miles S. by W. from Stafford, is situated close to the Birmingham and Liverpool Junction Canal. The village is neatly built, and contains a church with a handsome spire, and a well-endowed free grammar-school. Population of the township, 2991.

West-Bromwich is 6 miles N.W. from Birmingham. The parish contains a large population employed in coal-mines and iron-works. The church is ancient. Population of the parish, 26,121.

Burslem, one of the oldest market-towns in the Pottery district, is 3 miles N. by E. from Newcastle-under-Lyme. It contains a market-house of modern erection, and a church with an antient embattled tower. Population of the township, 12,631, including the modern suburbs of Longport and Dale Hall.

Burton-upon-Trent, a market-town, 22 miles E. from Stafford, is situated on the west bank of the Trent, on the borders of Derbyshire, which here communicates with Staffordshire by a bridge of 36 arches and 1545 feet in length. The town consists chiefly of two principal streets, one of which runs parallel to the river, and the other at right angles. There is a branch from Burton to the Grand Trunk Canal, which passes the town on the west side, and the Trent is navigable for barges up to Burton. The parish extends into Derbyshire. Population of the township, 4863.

Cannock, a village, formerly a market-town, 9 miles S.S.E. from Stafford, is a small place, which gives name to the adjacent extensive waste, formerly covered with oaks, called Cannock Chase. Population of the township, 1125.

Cheadle, a market-town, 14 miles N.N.E. from Stafford, is situated just within the moorland district of North Staffordshire, and in the midst of hills, now covered by recent plantations of timber-trees. The town is irregularly laid out, and consists of indifferently-built houses. The Tean Brook flows past it on the eastern side. The exterior of the parish church has suffered from modern alteration. A new Roman Catholic church, recently erected almost wholly at the expense of the Earl of Shrewsbury, is a splendid specimen of gothic architecture. The western tower is surmounted by a spire upwards of 200 feet high. Population of the parish, 4399, but this includes four or five neighbouring hamlets.

Eccleshall, a market-town, 7 miles N.W. from Stafford, is situated on a gently-rising ground, near the south bank of the river Sow, and consists of well and regularly-built houses. The church is a large ancient building. Population of the township, 1439.

Hanley and *Lane-End*, market-towns in the Pottery district, are noticed under *Stoke-upon-Trent*.

Leek, a market-town, 23 miles N. by E. from Stafford, is situated on an eminence. The streets are well paved, and lighted with gas. It has large manufactures of silk, especially ribands. The church is an old building, and has a tower with eight pinnacles. Population of the township of Leek and Lowe, 7233.

Lichfield, a city and see of a bishop, a municipal borough, parliamentary borough, and county of a city, in 52° 54′ N. lat., 1° 44′ W. long, is 116 miles N.W. from London by the North-Western Railway, and 17 miles S.E. from Stafford by the same railway. Lichfield is a very ancient city, the bishopric having been first established by Oswy, king of Northumberland, about 656, and a charter of incorporation granted by Richard II. in 1387. Many of the streets are narrow, but the houses in the principal streets are well-built, and the whole city is paved, lighted with gas, and well supplied with water. The cathedral was much injured by Cromwell's soldiers, but was thoroughly repaired by James Wyatt, the architect, in 1788. It stands near a beautiful piece of water on the north side of the city, and consists of a nave, choir, transept, central tower with a spire, and two other spires at the west end. The total length is 410 feet; the length of the transept

is 153 feet; and the height of the central spire is 280 feet. It contains many handsome monuments. The bishop's palace is near the cathedral. The city contains a guildhall, market-house, theatre, gaol, house of correction, a free grammar school, three parish churches, and several places of worship for dissenters. The municipal borough is divided into 2 wards, and is governed by 6 aldermen (of whom one is mayor), and 18 councillors. The city is nearly coincident with the municipal and parliamentary boroughs. The parliamentary borough returns 2 members. Population, 6587.

Longnor, a market-town, 33 miles N.N.E. from Stafford, near the borders of Derbyshire, is a small place situated near the source of the river Manifold, on the N.E. bank. Population, 485.

Newcastle-under-Lyme, or *Newcastle-under-Lyne*, a municipal borough and parliamentary borough, 2 miles W. from Stoke-upon-Trent, is just at the edge of The Potteries. The origin of the word Lyme or Lyne is uncertain. A small river called the Lyme runs near it on the western side. It is an ancient town, and was formerly considered as the chief town of The Potteries, but Stoke has now assumed that distinction. The town is irregularly built, and most of the houses are somewhat old. The town contains a guildhall, a borough-gaol, union-workhouse, almshouses, 2 churches, and places of worship for dissenters. The chief manufacture is of hats. The municipal borough is divided into 2 wards, and is governed by 6 aldermen and 18 councillors: population, 9245. The parliamentary borough returns 2 members: population, 10,038.

Penkridge, a village, formerly a market-town, 7 miles S. from Stafford, is situated on the S.E. bank of the river Penk. It consists of two principal streets, which unite as they approach the bridge. The parish church is ancient. Population of the township, 2488.

Rugeley, a market-town, 9 miles E.S.E. from Stafford, is irregularly laid out, but is remarkably clean and of respectable appearance. The church has been rebuilt of late years, but the tower and chancel of the old church still remain. Population of the parish, 3774.

Stafford, the county-town, and a municipal borough and parliamentary borough, is 132½ miles N.W. from London by the North-Western Railway. The town is situated on the N. bank of the Sow, and consists chiefly of two principal streets, which are prolonged into suburbs on the north and south, the southern suburb communicating by a bridge over the Sow. The houses are generally of brick, well built, and the streets are paved and lighted with gas. The town is well supplied with water. It is very ancient, and was formerly walled, but the walls were demolished by Cromwell's parliamentary army. The castle, about 1½ mile S.W. from the town, has been rebuilt in recent times. The town contains a spacious county-hall, a county-gaol and house of correction, a county-infirmary, a county-lunatic-asylum, two ancient parish churches (of which St. Mary's, formerly collegiate, is a fine large church with a central octagon tower), and places of worship for dissenters. The chief manufacture is of shoes. The municipal borough is divided into 2 wards, and is governed by 6 aldermen (of whom one is mayor) and 18 councillors. The parliamentary borough, which returns 2 members, is coincident with the municipal borough. Population, 9149.

Stoke-upon-Trent, a parliamentary borough, and the chief town of The Potteries, is 15 miles N. by W. from Stafford. The district named The Potteries extends nearly 8 miles in a direction N.N.W. and S.S.E., and is at the widest part nearly 3 miles in width. It consists of a series of about eight large towns (of which five are market-towns), situated near to each other, and in some places quite connected by intervening hamlets. The most southern of these towns is *Lane-End*, 2½ miles N.W. from which is *Stoke*, and then follow *Hanley*, *Burslem*, and *Tunstall*, which last is the most northern of the five market-towns. Between Lane-End and Stoke is *Fenton*, between Stoke and Hanley is *Shelton*, and W. of Burslem is *Longport*. Besides these towns there are about 17 other places which have distinct names. One of these is *Etruria*, where Wedgwood commenced and continued his series of improvements in the manufacture of earthenware. [WEDGWOOD.] The parliamentary borough extends from Tunstall to Lane-End, and thus includes the whole or nearly the whole of The Potteries. The oldest of the towns is Burslem, where the manufacture of earthenware has been carried on for centuries. The other towns are modern, and have arisen out of the extension of the earthenware manufactures. [POTTERY.] The Grand Trunk, or Trent and Mersey Canal, extends from Tunstall through The Potteries; and by this canal and its branches the earthenware manufactures are conveyed to Hull and Liverpool for exportation, and to numerous other places for home use. The parliamentary borough returns 2 members: population, 67,798.

Stone, a market-town, 7 miles N. by W. from Stafford, is situated on rising ground on the left or N.E. bank of the Trent, over which, on the Stafford road, there is a bridge. The principal street is along the road from London to Liverpool, and is paved. The church is a modern building at the south-east end of the town, and near it are some remains of an ancient monastery which was originally established here in the Saxon times. Population of the town, 2923.

Tamworth, a municipal borough and parliamentary borough, 7 miles S.E. by E. from Lichfield, is situated on the N. bank of the rivers Tame and Anker, just at their junction, and consists of several streets somewhat irregularly laid out, but paved and lighted with gas. The parish and borough extend into Warwickshire; the parish church however, a large and handsome old building with a fine tower, is in Staffordshire. There is a town-hall, with a gaol beneath it, and a union workhouse. The municipal borough is governed by 4 aldermen and 12 councillors: population, 3789. The parliamentary borough returns 2 members: population, 7662.

Tipton, or *Tibbington*, 3 miles S.W. from Wednesbury, is situated in the centre of the South-Staffordshire iron and coal district, and its present

size and importance are quite modern, and have arisen from the rapid extension of the iron manufactures. The old parish church has become a ruin, and two modern churches have been built. Population of the parish, which includes three or four neighbouring villages, 18,891.

Tunstall is noticed under *Stoke-upon-Trent*.

Tutbury, a village, formerly a market-town, about 22 miles E. by N. from Stafford, is situated on the slope of a hill which overlooks the valley of the Dove. The ruins of Tutbury Castle, formerly a place of great magnitude and strength, are on the brow of the hill. The church is the nave of a much larger building, and affords some fine specimens of Norman work. Population of the parish, 1335.

Uttoxeter, a market-town, 13 miles N.E. from Stafford, stands on rising ground near the Dove, which here separates Staffordshire from Derbyshire, and is crossed by a handsome stone bridge. The three principal streets diverge from the market-place, and the houses are generally well built. The church has been rebuilt, but the ancient lofty tower and spire remain. There are several iron-works in the neighbourhood. Population of the parish, which includes some neighbouring hamlets, 4735.

Walsall, a municipal borough and parliamentary borough, 8 miles N.N.W. from Birmingham, is situated on the eastern border of the South-Staffordshire coal-field and iron-district. The inhabitants are employed largely in manufactures of iron and brass; and there are coal-mines and freestone and limestone quarries in the neighbourhood. The town is regularly laid out, well built, and paved, and contains a town-hall, a borough-gaol, a parish church, three other churches, and several places of worship for dissenters. The parish church has been rebuilt, but the ancient tower surmounted by a lofty spire remains. The municipal borough is divided into 3 wards, and is governed by 6 aldermen (of whom one is mayor) and 18 councillors. Population of the township of Walsall Borough, 7393; of the township of Walsall Foreign, 13,457. The parliamentary borough returns 1 member: population, 19,654.

Wednesbury, 4 miles S.E. from Wolverhampton, stands on the slope of a hill, and is irregularly laid out. The church, which occupies the summit of the hill, is tolerably spacious, and has a western tower. The town is in the heart of the South Staffordshire coal and iron district, and it has considerable manufactures of fire-arms, machinery, edge-tools, files, screws, &c. Population of the parish, 11,625.

Wolverhampton, a parliamentary borough, 13 miles N.W. from Birmingham, is situated on high ground, and consists in general of well-built brick houses. The streets are irregularly laid out, and several are narrow and crooked, and not well-paved, but the whole town is lighted with gas. Wolverhampton is situated in the South Staffordshire coal and iron district, and produces largely manufactures of fire-irons, tinned and japanned iron-ware, locks, guns, files, screws, and a variety of other articles. The town contains a theatre, assembly-rooms, union-workhouse, 4 churches, and several places of worship for dissenters. The parish of Wolverhampton is very extensive, embracing 5 townships, and 3 chapelries: population, 70,370. The parliamentary borough returns 2 members: population, 92,943.

History, Antiquities, &c. — Previous to the Roman period Staffordshire appears to have formed part of the territories of the Cornavii, or Carnabii. Under the Romans it was comprehended in the province of Flavia Cæsariensis. The ancient roads, Watling Street, Ryknield Street, and Via Devana (Chester road) crossed the county.

There are traces of camps or other military works supposed to be Roman at four or five places, and Roman antiquities have been discovered in various places, especially a large quantity of silver coins at Rowley Regis. There are tumuli in various parts of the county, some of which are thought to be Roman.

On the conquest of South Britain by the Saxons, the county was included in the kingdom of Mercia, or of the Middle Angles. In the division of the island between the Saxons and Danes, in the time of Alfred, Staffordshire was partly included in the Danelagh or Danish territory, the Watling Street being the boundary; but the whole was recovered by Alfred's successors.

In the War of the Roses, the Earl of Salisbury, marching from the north towards London, in 1459, with 5000 men, was intercepted at Blore Heath, on the western side of the county, between Drayton and Eccleshall, by 10,000 Lancastrians under Lord Audley. The good generalship of Salisbury secured the victory. Lord Audley was killed, with all his chief officers and a fourth part of his army. A stone pedestal, surmounted by an ancient wooden cross, marks the field of battle. Richard III. was with his army at Tamworth just before the battle of Bosworth Field in 1485.

The principal monuments of the middle ages are ecclesiastical. Lichfield Cathedral is the most important. Croxden Abbey, between Cheadle and Uttoxeter, is a fine ruin in a narrow valley watered by a small rivulet.

Mary, Queen of Scots, was imprisoned for some time under the care of the Earl of Shrewsbury, at Tutbury Castle. In the civil war of Charles I. the county generally embraced the side of the parliament. Some Royalists, under the command of the Earl of Chesterfield, garrisoned Lichfield Cathedral and Close; but it was taken by the Parliamentarians, though with the loss of their general, Lord Brook (March, 1643). This post was retaken about a month after by Prince Rupert. The Parliamentarians occupied the towns of Stafford and Wolverhampton, and subsequently took Eccleshall Castle, and took and demolished Stafford Castle: they also besieged Tutbury Castle, but without success. In 1645 the king with his army marched through Staffordshire before the battle of Naseby, and was in it again after the battle. He appears to have had at this time two garrisons in the county, Lichfield Close, and Tutbury. Dudley Castle, in the insulated portion of Worcestershire, was also held by his adherents; but in the course of this or the following year

these all surrendered. In the rebellion of 1745 the Pretender's army was at Leek, while that of the Duke of Cumberland occupied Stone.

STAG. [DEER, v., 284.]

STAGE-COACH. [COACH.]

STAGMA'RIA, a genus of the natural family of plants called *Terebinthaceæ* from many of them producing a turpentine-like exudation. The tree *S. verniciflua*, which is the *Arbor vernicis* of Rumphius, is a native of the East India Islands, and though not very abundant in Sumatra, is occasionally found there. The wood of the tree is of a fine dark colour towards the centre. The bark exudes a resin which is extremely acrid, causing excoriation and blisters when applied to the skin. In this, as well as in becoming black when exposed to the air, it resembles the *Melanorrhœa*, Cashew-Nut Tree, Poison Oak, and many others of the *Terebinthaceæ*. According to Rumphius, this tree yields the celebrated Japan lacquer or varnish, and he considers it the same with that of Siam and Tonquin.

STAHL, GEORGE ERNEST, was born at Anspach in 1660. He studied medicine at Jena, took his degree of doctor there in 1683, and began to deliver lectures. In 1687 the duke of Weimar made him his physician; and in 1694 he was appointed to a professorship of medicine, anatomy, and chemistry in the university of Halle. He taught there for twenty-two years, and upon being appointed physician to the king of Prussia, went to Berlin, where he died in 1734.

The system of medicine which Stahl taught, and on which were founded the principles and practice of his numerous school, may be regarded as produced from a combination of the physiology of Van Helmont, which he learnt at Jena from G. W. Wedel, with the doctrines of Descartes respecting the agency of immaterial principles upon inert matter.

Haller, in his 'Bibliotheca Medicinæ Practicæ,' tom. iii., p. 577, gives a list, collated by J. C. Götz, of 250 medical works written or superintended and edited by Stahl. That in which his medical doctrines are most completely taught is entitled 'Theoria Medica Vera Physiologiam et Pathologiam tanquam Doctrinæ Medicæ partes contemplativas e Naturæ et Artis veris Fundamentis intaminata Ratione et inconcussa Experientia sistens,' 1707-8. All the peculiarities of his system however are discernible in his inaugural thesis 'De Sanguificatione,' Jenæ, 1684. His chemical works were comparatively few: he first proposed the phlogistic theory in 1697, in his 'Zymotechnia Fundamentalis.' The best brief account of his doctrines is in Haller, and in Sprengel, 'Histoire de la Medicine,' tom. v.

STAINDROP. [DURHAM.]

STAINES. [MIDDLESEX.]

STAIR, EARLS OF. [DALRYMPLE.]

STAIRCASE. This is an indispensable part of the interior of buildings which consist of more than a ground-floor, and stairs of some sort must have always been employed wherever there were upper rooms, or even to obtain access to the terraced roofs which are used in the East. But we are altogether ignorant of the character of ancient staircases. Vitruvius gives no information, neither has much light been thrown upon the subject by the discoveries at Pompeii. It may however very safely be taken for granted that the houses of the ancients had nothing whatever corresponding to the modern staircase. Nearly the same may be said with respect to the ancient domestic architecture of our own country, where, even in residences of the highest class, the staircases were generally very confined—placed within turrets, and exceedingly steep and narrow—narrow not only as regards the actual width of passage up and down, but the diameter or space occupied by the whole, there being no *well*, or central opening, but the steps winding around a solid newel, so that in ascending or descending a person is continually revolving,—without any 'foot paces' for resting upon, and cannot see whether he will encounter any one else. *Turnpike* was a term formerly applied to staircases of this kind. The modern appellation of *Corkscrew Stairs* corresponds to the Italian *Scala alla Chiocciola*, the French *Escalier à Limaçon*, and the German *Wendeltreppe*.

It was not till about the time of Elizabeth that staircases began to be planned more commodiously in this country, and made a decorative feature in the interior of a mansion. At a later period, staircases in mansions of a superior class were made disproportionably spacious, being upon a scale as to size with which the apartments themselves were not at all in keeping. The planning of a staircase is generally considered one of the most difficult matters in internal architecture, and it is certainly one that requires great consideration. Palladio, and others following him, have laid it down that the staircase ought to be seen immediately on entering a building; but it is impossible to establish any positive rule for what must depend upon particular circumstances; and this is by no means the best as a general rule. In a public building or place where strangers go in and out without inquiry, it may be desirable that the staircase should present itself at once; but this is not the case in private mansions.

One of the most simple and effective yet least common arrangements of a staircase, is that which may be described by the term *Avenue Staircase*, the stairs being continued in a straight line, though broken by spaces into a succession of flights, within what would else be a level corridor or gallery; and occupying its entire width. Simple as such plan is in itself, it is by no means adapted to general application, because, although it requires only moderate width, it requires considerable length, short flights, and ample spaces between them, and stairs with low risers and broad treads. Hence, though it may be referred to as an instance of an avenue staircase, the staircase leading to the round tower at Windsor Castle is more remarkable than beautiful or grand, leaving decoration out of the question; the altitude ascended being so very great.

In public edifices or large mansions, whatever be the plan of the principal staircase, it is generally *branched*, that is, there is first a wide central flight, and then two other narrower flights branching

off from it on each side, either at right angles to it or as return flights parallel to it; and it is hardly necessary to observe that in all such staircases the foot-spaces are large and there are no winders. The staircase at Goldsmiths' Hall, which is parted off from the vestibule by a glazed screen, is an example of more than ordinary splendour, being lighted by a dome.

The grand-staircase of the Reform Club-House, London, is an example, somewhat unusual in this country, though common enough in Italy, of what may be called an *Enclosed Staircase*. The flights are shut up between walls and consequently there is no open well, nor can the whole be seen at one view.

The architectural effect of a staircase will greatly depend upon the mode of lighting it. Where it is carried up only one floor, the best mode is to light it entirely from above, either through a dome or lantern in the ceiling, or by making the upper part of the walls just beneath the ceiling a continued lantern.

STALACTITE and STALAGMITE. Stalactite carbonate of lime occurs chiefly in long masses suspended from the roofs of caverns in limestone rocks. Water containing carbonate of lime held in solution by carbonic acid, trickling through crevices in the roofs of the caverns, gradually during its exposure to the air loses its carbonic acid, and consequently deposits its carbonate of lime; the water passing over the portion first deposited gradually adds to it, and eventually gives the carbonate of lime its great length and stalactitic character. The flatter deposits, called *Stalagmites*, are formed on the floor of the cavern by the water there depositing that portion of its carbonate of lime which is not separated during the formation of the stalactite. Caverns are sometimes nearly filled with these deposits, which in some cases are of very large dimensions. The most remarkable instances of their occurrence in Britain are in the cavern at Castleton in Derbyshire, and Macallaster Cave in the Isle of Skye: the grotto of Antiparos in the Grecian Archipelago, the Woodman's Cave in the Harz in Germany, and that of Auxelle in France, are striking instances of their formation in other countries.

STALAGMITES, the name of a genus of plants belonging to the natural order *Clusiaceæ* or *Guttiferæ*. The species are trees natives of the East Indies and Ceylon, and belong to the family which produces the gamboge of commerce. Dr. Wight states that one of the species, the *S. ovifolia*, which is a native of Ceylon, yields a true gamboge, which is employed in commerce.

STALBRIDGE. [DORSETSHIRE.]

STALL-FEEDING. The feeding of cattle in stalls for the purpose of fatting them more readily than by simple grazing, and at a time when they cannot get fat on pastures, as a regular part of the process of husbandry, is comparatively modern. In former times cattle were slaughtered in October and November, there being no possibility of buying fresh meat of any degree of fatness during winter, and salt meat was the food of all classes in that season. But now the process of fatting cattle goes on without interruption during the whole year, and fat beasts come as regularly to market in winter as in summer. Stall-feeding is now the principal means by which oxen and cows are rendered fit for the market.

In the system called *Soiling*, that is, of feeding horses in the stable and cattle in yards with food brought to them as it is cut in the meadows or fields, one object is to save the waste of food which is occasioned by treading the pastures, and by their choosing the sweetest grasses to the neglect of the coarser. The principal object however is to save the manure, which in the stable and yards is all preserved. In *Stall-Feeding* another object is looked to, that of increasing the substance of the animal, especially the fat; and to do this judiciously and with profit requires much experience and attention. It has been proved that animals require a certain portion of meat and drink to keep them alive, and that this quantity, in the same species, is in general proportion to the weight of the animal. If an animal has his exact ration of food, he will continue in health, but he will not increase in weight: in this case therefore it only produces a certain portion of manure, which is not equivalent to the food consumed. If a larger quantity be given, the animal, if in health, will increase in weight, and the more food he has, within a certain limit, the faster will be this increase: but there is a point where increase stops; and if by any means the animal is induced to take more, his stomach will be deranged, and he will become diseased, and occasion loss by over feeding. The quality of the food as well as the quantity should also be attended to; for a truss of fine well-made clover, lucern, or sainfoin hay, may contain double the nourishment of another truss of coarse marsh hay. The best kind of food should always be reserved for fatting cattle. Roots are excellent *helps*; but roots *alone* are too watery, and must be corrected by dry food, such as straw cut into chaff, or good hay, and especially farinaceous food, whether it be corn ground or bruised, or oil-cake after the oil has been expressed. By a judicious mixture of food a much greater increase of flesh may be produced than by an irregular mode of feeding, however good the quality or abundant the quantity given may be. It is of great importance that the cattle should be fed with great punctuality, at certain hours during the day, and that the troughs should be cleared of all the remains of food which they do not eat at each time of feeding. Rest and sleep are great aids to digestion, and a little gentle exercise after sleep prepares the stomach for a fresh supply of food. Air also is highly conducive to health; and hence those beasts which are allowed to move about in a loose stall, or a small yard protected from the rain and wind, thrive better in general than those which are tied up. Experience shows also that all domestic animals like company, and that they are more contented and quiet when they have a companion than when they are alone. This is the reason why they are frequently put up in pairs. Whatever promotes the health and comfort of the animal will be most profitable to the feeder.

STAMBOUL. [CONSTANTINOPLE.]

STAMENS, in Botany, the organs which constitute the last whorl but one of the series which form the flower in plants, the Pistil with its parts forming the last or innermost whorl. These organs were called by the older botanists *Apices*, and by English writers Chives. They constitute the male organs of the flower, and are formed principally of cellular tissue. They are composed in most cases of three parts: 1, the filament, a long slender organ, on the summit of which is placed—2, the anther, which is a little case, mostly double, containing—3, the pollen, which is composed of little grains constituting the fructifying influence of the plant.

The stamen in theoretical botany is considered, as well as the other parts of the flower, a modification of the leaf. Although its form, structure, and functions differ so much from the leaf, it is not difficult to point out the series of modifications by which the one is converted into the other. In many plants the leaves cannot be distinguished near the flowers from the bracts, and these again cannot be distinguished from the sepals forming the calyx; whilst the calyx often insensibly passes into the corolla, and parts of flowers are often seen possessing both the characters of sepals and petals. In the case of the white water-lily, a good example is offered of the passage of petals into stamens, thus completing the series of changes from leaves to stamens. In this plant, a gradual contraction of the inner petals is seen to take place at their upper parts, the cellular tissue becomes coloured, and partakes of the character of pollen-grains, and these changes become more and more decided till the whorl of stamens is fully established in the centre of the plant.

In the change that has thus taken place of the leaf into the stamen, the filament of the stamen represents the midrib of the leaf, whilst the anther and its pollen are modifications of the lamina and cellular tissue of the leaf. It is well known that the cellular tissue of the upper and under surface of the leaf differ very considerably, and it is to these parts that the anterior and posterior cells of the anther are analogous.

In their normal position in the flower the first row of stamens is always alternate with the petals; and as these organs are alternate with the sepals, the stamens are opposite the sepals. If there is a second row of stamens, it will be alternate with the first, and thus of course opposite the petals. It however frequently happens, as in the primrose, that there is only one row of stamens, and yet opposite the petals. In such cases the anomaly is accounted for by supposing that the first row has not been developed, and consequently the second stand in their original position, that is, alternate with the aborted row. When there are only five petals and ten stamens, as in Silene, the latter are supposed to form a double row.

The stamens are said to arise from various parts of the flower, and according to the part of the flower from which they arise terms have been applied to express this origin, which are of great importance in systematic botany. When the stamens arise from (or, as it is often expressed, are inserted into) the calyx or corolla, they are said to be *perigynous;* when they arise from under the pistil or ovary, *hypogynous;* when from the pistil itself, *epigynous.* The classes and subclasses of the natural system of Jussieu are subdivided according to the existence of these distinctions in the families of plants. The above terms however must not be supposed to express the fact that the stamens do really originate in the parts from which they are said to arise or are inserted into. The fact is, the stamens always arise from a point in the axis of the flower between the petals and ovary; and when attached to these or other parts, it must only be looked upon as an adhesion of one organ to another. Thus when it is said that the stamens are inserted into the calyx of the flower of the apple, it is meant that they adhere to the calyx up to a certain point, from whence they appear to arise. The same must be said of their connection with other parts.

The *Filament* of the stamen is the representative of the petiole or midrib of the leaf, and in structure and function resembles that organ, and is not any more essential to the existence of the stamen than the petiole is to the leaf.

The filaments are often combined into a single mass, the anthers being separate. When this is the case, they are said to form a brotherhood, and the term *adelphia* is applied to them. When there is only one such combination, the stamens are said to be *monadelphous*, as in Geranium; when there are two such unions, or even if only one stamen is separated from the rest, they are called *diadelphous*, as in Fumaria, Vicia, Lathyrus, &c.; when there are more than two, as in Hypericum and Melaleuca, they are *polyadelphous.* The filaments are sometimes of different lengths; when two are tall and two are short, as is seen in the whole of the natural family Lamiaceæ, they are called *didynamous;* if four are long and two are short, as is seen in the family of Cruciferæ, they are *tetradynamous.*

The number of stamens in flowers is expressed by a Greek numeral being prefixed to the word *androus:* thus flowers with one stamen are *monandrous;* with two stamens, *diandrous;* with three stamens, *triandrous*, and so on.

It was on the number of stamens, and their arrangement and relations, that Linnæus founded the classes of his sexual or artificial system of the arrangement of plants.

STAMFORD. [Lincolnshire.]

STAMMER. The terms Stammer and Stutter are synonymously adopted to denote that involuntary interruption of utterance arising from difficulty and often total inability to pronounce certain syllables, the speech apparatus being frequently affected with spasms in the effort to speak.

In some stammerers the spasm consists of involuntary movements similar to *Chorea* (St. Vitus's Dance), which occasionally affects other than the speech muscles. Stammer with this spasm distorts the utterance by an involuntary repetition of some part of the syllable, as ge-ge-ge-good de-de-de-day. The repetitions may or may not be vocal. In

other stammerers the spasm consists of involuntary immobility, similar to *Tetanus* (Lock-Jaw), commonly of the form termed *trismus*, in which the mouth is closed, and the jaw cannot move to open it; and sometimes of the form termed *Anti-trismus*, in which the mouth is open, and the jaw is equally incapable of moving to shut it. Stammer with this spasm distorts the utterance by an involuntary extension of some part of the syllable, as l——augh, where the *l* is much prolonged.

In the looseness of language resulting from inexact knowledge, all kinds of difficult and defective utterance are misnamed stammer, as the difficult utterance of the intoxicated, the faltering utterance of the paralytic, the imperfect utterance of deep emotion, as of fear, the defective utterance of malformed organs of speech, and the hesitation in discourse when the suitable word fails to present itself to a speaker's mind. Such affections of the utterance however are distinct from stammer, for

1. The stammerer's inability to pronounce words remains during health, soberness, calmness of mind, and also when the appropriate words occur to him.

2. The stammerer feels his difficulty of utterance essentially to consist in a refusal of some part of the speech apparatus to obey his will.

3. The stammerer's utmost efforts to force out any difficult word commonly excite spasm, and increase it if it previously existed.

4. The stammerer's inability to speak is intermittent: the same syllable is not always equally difficult to utter, and is sometimes uttered with ease.

Those circumstances distinguish stammer from the misnamed stammer of paralysis, intoxication, &c.

Now to understand the nature of stammering, it is necessary to know the mechanism of utterance, which may be thus briefly described:—

The voice is produced in the larynx, whence it issues into the pharynx. The pharynx opens into the nose and into the mouth; and by means of a curtain valve, named the Velum Pendulum Palati, we can direct the issue of breath through the mouth or the nose, or through both mouth and nose at once. The voice is produced in the larynx, an audible sound, which may possess the distinctions of song-notes (musical sounds), as those of pitch, loudness, and quality, or it may possess the peculiar conditions of those distinctions which constitute speech-notes. In the pharynx and mouth the volume of voice is magnified, and its quality is modified.

Observation and experiment concur to prove that the production of voice is an acoustic phenomenon depending on mechanical principles similar to those which regulate the production of sound from an inanimate instrument; for it is now agreed that the upward current of air passing through the larynx produces an effect on the vocal ligaments precisely similar to what it would if the larynx were an inanimate mechanism. The voluntary power over the larynx adjusts it to be acted on by the current of air, and thus the voice is to be regarded partly as a mechanical and partly as a physiological result.

Observation and experiment concur to prove that the modification of voice into speech is also an acoustic phenomenon depending on principles similar to those which regulate the modification of sound by an inanimate instrument; for it is now agreed that the modification of voice into speech in passing through the variable cavity of the pharynx, mouth, and nose, produces an effect precisely similar to what would be produced if the variable cavity were an inanimate mechanism.

Thus both in voice and speech the production and modification of vocal sound depend on the laws of acoustics, while the adjustments of the various parts of the apparatus which produce and modify the voice depend on voluntary muscular movement. The one is mechanical, the other physiological.

It is familiarly known that the movement of every organ is effected by muscular contraction; that both voluntary and involuntary contraction of the muscles depend on the nerves; that all voluntary contraction is regulated by the brain; and also that the voluntary contraction of one muscle is accompanied by an adjusted voluntary relaxation of its antagonist muscle.

The speech-apparatus may be considered as consisting of the lungs or bellows, which can send a current of air through the trachea or windpipe to the larynx, which is situated on its summit. In the larynx this current of air can be vocalised into song, or into speech-sounds, at will, which, on passing through the variable cavity, consisting of the mouth, pharynx, and nose, can be further modified into speech. Thus the speech-apparatus, as a whole machine, consists of the respiratory, the vocal, and the enunciative organs.

The respiratory apparatus consists of the chest, the lungs, and the air-passages. The respiratory movements are involuntary and periodic; the inspiration of breath alternates with its expiration; and in both acts the breath flows in a continuous stream. There is a periodic action of the inspiratory muscles, but whether their action alternates with an action of the expiratory muscles, or simply with the spontaneous return of the parts by their elasticity and gravity, is yet undetermined. The muscular actions during the tranquil respiration of repose appear to be limited to periodic inspiratory movements.

The movements of respiration include the motions of the diaphragm, the abdominal and thoracic muscles, and those of the larynx, which dilate and contract the aperture of the glottis. The nerves engaged in these movements are the phrenic, the spinal accessory, the vagus, many of the spinal nerves, and the portia dura of the seventh. The will can influence and somewhat modify the movements of respiration; thus we can prolong or shorten the duration of an inspiration, and we can delay or hasten to begin one. We have similar control over the expiration of the breath; and we have power also to limit, or nearly so, the movements of respiration to sub-groups of muscles: thus we can breathe by the diaphragm alone, or by the ribs alone.

The machinery of respiration, of vocalisation, and of enunciation, together constitute the speech apparatus. The various muscles subservient to

those separate acts associate their functions to adjust and give play to the speech apparatus as a united whole—as a machine for the production of speech. Thus to pronounce an elementary sound, as the *ee* of the word eel, the muscles of speech (consisting of the respiratory, the vocal, and the enunciative) act in simultaneous association to produce the proper adjustment of the speech apparatus. There are nearly fifty distinct elementary sounds in the English language, and hence as many different adjustments of the speech apparatus are required for their utterance. And to pronounce a word consisting of several elementary sounds articulated together, as the word *steam* (which consists of the elements *s*, *t*, *ea*=*ee* of eel, and *m*), the simultaneous group of associated muscular movements required for each element must succeed each other in one syllabic impulse. Now it will be observed that in adjusting the speech apparatus from a previous state of rest to pronounce any given element, the muscles have a certain movement to perform, but the movement is somewhat different when they have to readjust the speech-apparatus from a previous adjustment. This fact may be verified in pronouncing the *ee of eel* by itself as a distinct syllable, and afterwards the words *steam*, where the same vowel follows a *t*, from which adjustment that for the *ee* has to be made. The general conditions of respiration, vocalisation, enunciation and articulation, under which stammer occurs, are subjoined.

I. *Respiration.* 1. Most stammerers manage their respiration badly, although nearly all can speak freely in a whisper. 2. They feel that they have insufficient breath to speak. This sensation however arises less from an insufficiency than from attempting to speak on an involuntary inspiration. The breath is expired to be vocalised by the voluntary action of the ribs, which mechanically contract the chest's cavity. The ribs however cannot accomplish this when they are in the position in which an involuntary inspiration leaves them; they must be raised to that position to which a voluntary inspiration carries them, before they can act with mechanical effect upon the chest to expire a holding breath for the purpose of conversation. 3. With the sensation of insufficiency of breath, some feel also a pain at the pit of the stomach. This pain is connected with attempting to speak on an involuntary inspiration, and its severity is commonly increased by struggling to speak.

II. *Vocalisation.*—1. *Song-Voice.* The song condition of voice seldom presents any difficulty to stammerers. Cases of stammer in the song-voice very rarely occur; and it is known that stammerers, when struggling with a word, are sometimes advised to sing it. 2. *Speech-Voice.* Stammer occurs in all parts of the speech-note, more frequently however in the middle than towards the end, but most commonly at the initial. 3. *Pitch of Voice.* Changes of Pitch, whether concrete or discrete (slide or skip), through narrow intervals of the scale, present difficulties which wider changes of pitch do not. Stammerers can mostly declaim, if they cannot converse or quietly read; and it is well known that wider intervals of pitch occur in declamation than in ordinary conversation. 4. *Loudness of Voice.* When the loudness of the speech-note is of the form of the musical *diminuendo*, which begins abruptly and gradually diminishes in loudness, a difficulty is presented to the stammerer wich does not occur if the form be the musical *crescendo*, where the note begins feebly and gradually increases in loudness. 5. *Quality of Voice.* The conversation tone presents a greater difficulty than the falsetto, or than the full enriched voice of epic declamation. 6. *Quantity or Duration of Syllables.* Short and inextensive syllables present a greater difficulty than the long and extensible. 7. *Accent.* The unaccented syllables of discourse seldom offer any difficulty to stammerers. The element, or combination of elements, which is difficult to utter with accent, is easy to utter without accent. The accent given by stress is infinitely more difficult than that given by extended duration. 8. *Rhythmus.* The measured movement of verse is easier for the stammerer than the unmeasured movement of prose and conversation.

III. *Enunciation.*—Syllables are of two kinds, viz.:—1. Those composed of one elementary sound. 2. Those composed of more than one elementary sound. 1. *Vowels.* A vowel alone may constitute an accented syllable, and even a whole word, of which the pronoun *I* and the article *a* are familiar examples. Stammer often occurs on such syllables. The diphthongal vowels present less difficulty than the monophthongal; and the long much less than the short vowels. 2. *Consonants.* A consonant alone never constitutes a syllable; and when two or more are combined together without a vowel to form one, such occur only as unaccented final syllables of words. The stammerer's difficulty is less to utter the elementary sounds singly than to articulate them so as to form syllables.

IV. *Articulation.*—As before stated, the elementary sounds are articulated in three orders of succession:—1. The vowel followed by a consonant. 2. The consonant followed by a vowel. 3. The consonant followed by a consonant. Stammer occurs in each of these modes of articulation. There is seldom any difficulty to articulate two consonants together; some however is felt in postfixing a consonant to a vowel, and the greatest is felt in adding a vowel to a consonant. Of this latter class there is most stammer when the consonant is *p*, *t*, *k*, or their voice correlatives *b*, *d*, *g*, especially if they precede a short vowel, as in the examples pit, top, king, bud, dot, get.

To these general conditions of voice and speech under which stammer occurs, may be added other conditions of sex and age. The great majority of stammerers are of the male sex. Few stammer from their early infancy; children commonly speak freely until about five years of age. An occasional difficulty is first observed, which becomes more frequent up to the tenth year, when it is commonly at its maximum; although the spasm frequently increases in severity up to manhood. In the decline of life sometimes the stammer spontaneously diminishes, and it has been known to entirely disappear. The voices of

childhood and old age differ in several respects from that of the intermediate period of life. A comparison of these voices with the above described vocal conditions of stammer will account for the occasional spontaneous disappearance of stammer in old age. The speech melody of infancy is set in a high pitch, which often runs into the falsetto, and is much intersected with wide intervals both concrete and discrete. The loudness is chiefly of the *crescendo* form on long whining quantities. The voice of old age often falls into the tremulous scale, and the rate of utterance is slow, steady, and uniform. The loudness is not often of the *diminuendo* form, and is on extended quantities. The accent is given to syllables by quantity rather than by stress, deliberate pauses are made, and the whole system is marked by the self-possession of experienced age conversing with a consciousness of superiority, if in nought else, in a longer reach of memory.

Varieties of Voice-Stammer. — Voice-Stammer is of two kinds,—1. Difficulty to produce voice. 2. Difficulty to produce voice in quantities adjusted to the syllables' demands.

Variety 1.—That difficulty which arises from ill-regulated respiration, in which the effort to vocalise is accompanied with a feeling of insufficiency of breath.

The physiology of this stammer indicates a discipline for its removal. The organs of respiration must be drilled to rightly change the involuntary act of respiration to the voluntary, which, with a course of rhythmus, will effect a permanent cure.

Variety 2.—That difficulty to produce voice which is occasioned by an involuntary closure of the glottis. The remedy consists in keeping open the glottis, by issuing a drone sound, such as the *e* of the word berry, before beginning to speak, and in joining the prefixed drone to the words.

Variety 3.—That difficulty to produce voice which is occasioned by an involuntary twitching of the glottis similar to chorea. The glottis must be disciplined on *sounds* of the *crescendo* form of loudness in a low pitch, and proceed gradually from the song-voice to that of speech. In this stammer, which arises from being unable to produce voice in quantities adjusted to the syllables' demands, vocalisation freely takes place, but two or three short or accented syllables following near together throw the glottal muscles into choreal spasm. The principles of discipline for the spasm will be similar to the preceding variety of stammer.

Speech Stammer is either *enunciative*, or difficulty to produce the elementary sounds; or *articulative*, or difficulty to join them together. Enunciative stammer, or that which takes place on the single elementary sounds of speech, can be permanently remedied only by a systematic training of the disobedient organ which occasions it. The organ must be disciplined to perform the necessary movements under all conditions of voice, which, accompanied with a general training of the whole apparatus of speech, conducted on rhythmical principles, will effectually remove the stammer. Articulative stammer can be permanently remedied only by a systematic training of the disobedient organs to perform their required movements for the several adjustments of the mouth which are necessary to articulation.

From what has been stated it appears that there are three functional causes of inability to control the muscular movements which are required for utterance; viz.:—

1. Spasm, both of the tetanus and chorea forms. All muscles are liable to spasm. Spasm of the larynx, the tongue, the lips, and the masseter muscle, are each sources of stammering.

2. Defect in the associating power, which combines the voluntary movements of different organs in one simultaneous act, or in an allied succession of acts. Defective association of vocalisation with respiration will occasion stammer; for perfect association of the voluntary movements of the larynx with those of the chest are required in utterance. Some stammerers can associate the movements of the larynx and chest with facility, but they stammer from inability to associate with them the movements of the jaw and lips. And other stammerers who can associate these movements, are unable to associate with them the movements of the tongue, and they stammer in consequence.

3. Involuntary associate movements: as, after mimicking a stammerer it has been found that those muscular movements, which in the mimicry were voluntarily associated with the proper movements of utterance, have suddenly become linked to them so firmly in allied motion, that he is unable to dissociate them, and an actual stammer results. Thus those movements which were voluntary in the mimicry are now (in accordance with an ill-understood law of nervous action) excited independently of or even contrary to the will, by the voluntary impulse which is directed to effect the proper movements of utterance.

The various kinds of stammering and the appropriate remedies for each kind are treated of in Cull's *Observations on Impediments of Speech*; and Cull's *Stammering Considered*.

STAMPS, STAMP ACTS. Stamps are impressions made upon paper or parchment by the government or its officers for the purposes of revenue. They always denote the price of the particular stamp, or in other words, the tax levied upon a particular instrument stamped, and sometimes they denote the nature of the instrument itself. If the instrument is written upon paper, the stamp is impressed in relief upon the paper itself; but to a parchment instrument the stamp is attached by paste and a small piece of lead, which itself forms part of the impression. These stamps are easily forged, and at various times forgeries of them upon a large scale have been discovered. The punishment for the forgery of stamps was made a capital offence by the act of William and Mary, and continued so until the year 1830 (11 Geo. IV. & 1 Wm. IV. c. 66), when it was made punishable by transportation.

In France stamps are used both for the authentication of instruments and as a source of revenue.

The stamp tax was introduced into this country in the reign of William and Mary (5 W. & M. c. 21). By the act 38 Geo. III. c. 78, a stamp duty is imposed on newspapers, and by a subse-

quent act inventories and appraisements are required to be stamped. Legacies are largely taxed by means of stamped receipts. Stamps are also used as a convenient method of imposing a tax upon a particular class of persons: thus, articles of apprenticeship are subject to duty, and articles of clerkship to a solicitor to a tax of 120*l*. Before a person commences practice as a physician, an advocate, a barrister-at-law, or an attorney, he must pay a tax varying from 50*l*. to 10*l*., under the form of a stamp upon admission. Notaries public, bankers, pawnbrokers, and others, must obtain a yearly licence in order to exercise their callings.

The schedule to the act 55 Geo. III. c. 124, which consolidates all the previous acts, occupies nearly 100 octavo pages. Since the year 1815 the stamp duties have been mitigated. The 5 Geo. IV. c. 41, exempts law proceedings from stamps; and the stamps upon newspapers were reduced from fourpence to a penny by 6 & 7 Wm. IV. c. 76 (1836), which duty exempts the paper from postage. As to the stamp duties on advertisements, see ADVERTISEMENT.

In order to protect the revenue, the stamp acts usually impose a penalty upon any fraudulent evasion of their provisions.

The courts of law have generally interpreted the stamp acts with the same strictness with which penal statutes are interpreted, giving to exemptions as large an extension as the words will admit. On the other hand, the judges oppose the admission of an instrument so constructed as to evade the payment of the stamp duty.

The main rule in the levying of these duties is that each distinct transaction between separate parties, recorded by a written instrument, shall have a separate stamp attached to it.

The general principles which regulate the courts in the interpretation of the stamp acts are, that fraudulent evasion of the stamp duties shall be punished by forfeiture of all benefit from the document which ought to have been stamped; and that a just claim shall not be evaded or a fraud be effected because the just claimant has unintentionally violated the stamp laws.

The stamp duties and the custody of the dies are placed under the superintendence of commissioners appointed under the great seal. The 4 & 5 Wm. IV., c. 60, amended by 5 & 6 Wm. IV., c. 20, consolidated the Board of Stamps. The commissioners transact their business in Somerset House, London. The endeavour to impose stamp duties upon our American colonies in 1765 was one of the causes of the American Revolution.

The law respecting stamps, and a reference to the principal cases cited, are contained in Chitty's 'Practical Treatise on the Stamp Laws.'

The stamp duties have hitherto acted very unequally on small and on large transactions, and fully justify the statement that the legislature that imposed them were desirous to shift the burden of taxation from the rich to the middling classes. In the session of Parliament of 1850 two acts were introduced by the Chancellor of the Exchequer for reducing the duties and remedying the inequalities, but neither of them met with the approval of the House of Commons, and were consequently withdrawn. The Chancellor of the Exchequer however expressed his intention to introduce another act before the close of the session.

The net produce of the stamp duties in the year which ended Jan. 5, 1849, was 6,643,772*l*.

STANDARD. [BANNER.]

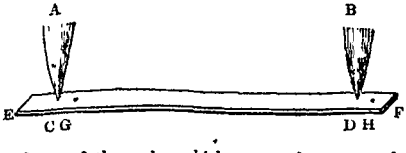
STANDARD MEASURE, WEIGHT, &c. The common purposes of life require a continual reference to lengths and weights which it is intended shall be always the same, but as to which it is sufficient that they should be very nearly the same. Nature continually presents resemblances between the lengths and weights of similar things. As to lengths, for instance, the corresponding parts of different human bodies are so nearly of the same length, that, throughout the same country at least, there could never be wanting a sufficient mode of laying down a length from description, as long as a well-proportioned man, neither very tall nor very short, was to be found. The foot, the cubit, the palm, the digit, the fathom, &c., differ so little in different persons, that the occurrence of these words as measures of length is no ways surprising; and when we come to that state of society in which an attempt is made to establish a uniform measure, independent of the slight variations which exist between one person and another, we might expect to see, as we do see, these names preserved to denote conventional lengths, originally derived from the human body, but fixed, or attempted to be fixed, by law.

Measures are wanted for two distinct objects, the commercial and the scientific. The wants of natural philosophy have grown up within the last two centuries; while so early as Magna Charta it was one of the concessions to the grievances of the subject, that there should be one weight and one measure throughout the land. But though a few acts of parliament were sufficient, in process of time, substantially to establish the political rights which that charter was intended to grant, hundreds of them, down to the present time, have been ineffectual in producing the use of one weight and one measure. This unity was for commercial not scientific purposes; and the resemblance of natural objects was supposed to be a sufficient reliance for obtaining it. Some of the old statutes expressly make the inch to be the length of three barleycorns, placed end to end, round and dry, from the middle of the ear. Standards were made no doubt from this definition; or at least it was supposed that if the existing standard should be lost, the barleycorns would enable its restoration to be effected. Our readers may smile at what they think so rude a contrivance; but the same principle carried a little farther might be made very efficient in preserving a measure. Suppose, for example, that the government were now to think it desirable to recover the three-barleycorn inch, or at least to invent one which should be capable of being recovered. They would put together not three barleycorns, but three thousand, or thirty thousand; or many different collections of three thousand or more. The average inch deduced from these would be capable of being recovered at any time from the

same grain grown in the same soil. A commercial standard might be easily recovered from many different modes of proceeding: for example, the average height of the barometer at a given place throughout any period of five years is so nearly the same from one five years to another, that a commercial standard might be sufficiently well obtained from it. It would be of little consequence if the yard were wrongly recovered by one-hundredth or even one-tenth of an inch, in any matter of buying and selling.

It is the *scientific* standard at which the government has been aiming during the last century. The object here is, first, to measure the old standards to the utmost accuracy of which our senses, assisted by microscopes, are capable; secondly, to discover the means of reconstructing a lost standard. In the more delicate operations of natural philosophy and astronomy, our knowledge cannot go down to posterity unless they know within the thousandth of an inch what it is that we call a yard. The public at large has never understood the reason why so much trouble has been taken; and perhaps the members of different administrations, while trusting such investigations to men of science, and relying on them for the whole conduct of the matter, may have wondered at the great difficulty which there seemed to be in the way of furnishing the shopkeepers of all generations with yard measures and pound weights of the same values.

To elucidate the *principle* merely of the manner in which scales are compared, we must first show how it is that very small lengths can be measured. A screw can be very accurately constructed, say with threads one-twentieth of an inch apart: if this screw be the axis of a circular plate, which turns with it, and the edge of the plate be divided into one hundred parts, each of these parts will be very perceptible, if the plate be three-quarters of an inch or more in diameter, and it will not be difficult to estimate the half or quarter of one of the divisions. Let there be an index attached to the frame, which does not move with the screw, by which it may be seen, when the plate (and with it the screw) is turned, how many divisions it is turned through. Now since a whole turn of the screw moves the end of it forward through one-twentieth of an inch, a motion of the plate which passes one of the divisions over the index, or the hundredth part of a turn, sends the end of the screw forward through only one two-thousandth of an inch, and a quarter of a division answers to one eight-thousandth of an inch. Suppose a couple of such screws, each of which is attached to a pointer, as in the following diagram, in which the pointers only are inserted,



and one of the scales which are to be compared; the screws which move the pointers and all the frame-work being omitted. Observe also that this is not the apparatus employed, but only a convenient illustration of it.

It is supposed that A and B can be moved by the screw motion in such manner that a motion so small as the eighth-thousandth of an inch may be given to either. The scale at present used is E F, on which are two points, C and D, which are, or are supposed to be, exactly a yard asunder. Let the screws be moved until the ends of the pointers, which all but touch the scale, are exactly over C and D; then if the scale be removed, the length C D is retained in the distance between the points of the pointers. Now let another scale be introduced, and let its points be brought as near as may be, conveniently, to the pointers; it is supposed that the distances C D and G H are very nearly equal, for workmen used to the construction of mathematical instruments never fail in making two yard measures agree within a fiftieth of an inch. Perhaps the reader will say the point G might be brought *exactly* under the pointer A and then the pointer B alone would show whether the present scale is shorter or longer than its predecessor: but as the pointer is much less cumbrous than the scale, it is easier and safer to put the scale in a convenient position than to attempt to place it in one exactly given. This being done, move the pointer A from C to G, and observe how many turns, or how much of a turn, of a screw is required to do it: say it makes 87½ divisions of the plate pass the index. Also move the pointer B from D to H, which makes, say 97¾ divisions of the plate pass the index. Now we obviously have

$$GH = CD + DH - CG;$$

and since DH is longer than CG, it appears that GH exceeds CD by the excess of DH over CG, answering to 97¾—87½, or 10¼ divisions of the plate, being 10¼ times the two-thousandth of an inch, or .005125 of an inch. This experiment may be repeated any number of times, and, as may be expected, the results will not agree, since it is not to be supposed that any two persons, or the same person at two different times, will agree in their estimation of exact coincidence between the pointers and the ends of the scales. As in other cases, the averaging of the discordant results will bring out the truth very nearly.

The difference between the apparatus which was actually used in the latest experiments and that above described was as follows:—The pointers were micrometer microscopes, in which the intersection of two fine spider-threads, placed at the focus, was the point which was made, by a slow screw motion, to coincide with the centre of the (magnified) dot (or line) which formed the extremity of the scale. The micrometer head (the circular plate of the preceding illustration) was divided into 100 parts, each of which was found to be equivalent to one 20,000th of an inch; or a whole turn of the screw, altering the position of the intersection of the spider's webs by one 200th of an inch. The magnifying power used was about 27 times in linear dimension. It was attempted, in each experiment, to estimate tenths of the divisions of the micrometer-head, or to attain the 200,000th part of an inch.

The following is the existing legal definition of standards according to the act of 1825 :—

1. The straight line or distance between the centres of the two points in the gold studs in the straight brass rod now in the custody of the clerk of the House of Commons, whereon the words and figures 'Standard yard, 1760' are engraved, shall be the original and genuine standard of that measure of length or lineal extension called a yard . . . the brass being at the temperature of sixty-two degrees of Fahrenheit's thermometer. The act goes on in many words to say that the pendulum vibrating seconds of mean time in the latitude of London in a vacuum at the level of the sea is 39.1393 inches of the said standard.

2. The standard brass weight of one pound troy weight, made in the year 1758, now in the custody of the clerk of the House of Commons, shall be the original and genuine standard measure of weight. . . . The act goes on to say that the cubic inch of distilled water, weighed in air by brass weights, at 62° of Fahrenheit, the barometer being at 30 inches, is equal to 252.458 grains.

We have not space for the history of this subject. The last event in it was the report (in 1841) of a commission of men of science appointed in 1838. After reciting that the standard yard was rendered absolutely useless by the fire at the House of Commons, and that the standard troy pound was altogether missing, the commissioners begin by recommending the total disuse of all attempts to procure a natural standard, and the return to the old plan of standards manufactured in metal; that four copies of the best existing representations of the old standards should be made, and carefully compared; that one of these copies should be hermetically sealed, and imbedded in the masonry of some public building, marked by an inscription, and only to be opened by Act of Parliament; that the standard of capacity be defined by that of weight, not by that of length; that various precautions, minutely named, be taken for the preservation and safe custody of the others; that the avoirdupois pound, and not the troy, be the standard; that the government purchase all the known copies of the old standards which have been noted in scientific operations; that no circumstance would contribute so much to the introduction of a decimal scale in weights and measures as the establishment of a decimal coinage, which is strongly recommended; that the old Gunter's Chain be preserved in the measurement of land; that a measure of 1000 or 2000 yards receive a name, and be used co-ordinately with the mile, with a view to the gradual disuse of the latter; &c. Steps have been taken to recover a standard yard, by comparison of the existing scales which had been compared with the last standard.

STANDARDS are those trees or shrubs which stand singly, without being attached to any wall or support. In gardening and planting they are distinguished into three kinds, the Full Standard, the Half Standard, and the Dwarf Standard.

The Full Standards are trees whose stems are suffered to grow seven or eight feet or more without allowing side branches to be developed, but at this point are allowed to spread in all directions.

Half Standards are those plants which are allowed to run up three or four feet and then permitted to branch out. The height at which it is desired a tree should branch out may be frequently secured by cutting off the lower branches up to that point, or by cutting down the primary branch and allowing the highest lateral branches to develope themselves. Many shrubs grow naturally in this manner, and when fruit-trees are grown in this way, it is done as a matter of convenience for gathering the fruit, or ensuring their growth under particular circumstances.

Dwarf Standards are those plants whose stems are only allowed to reach a height of one or two feet before they are permitted to branch, and this object is effected in the same manner as in the last. All kinds of fruit-trees, as apple, pear, plum, and cherry trees, may be grown as dwarf standards, but these trees do not bear so good fruit under such treatment as when allowed to grow as half or full standards.

STANDIA, Island. [CANDIA.]

STANHOPE. [DURHAM.]

STANHOPE, GEORGE, D.D., was born in 1660, at Hartshorne in Derbyshire, of which his father had the living. He was sent to Eton, whence he passed to King's College, Cambridge. He had the living of Tewing, but resided for the greater part of his life on his vicarage of Lewisham, to which he was presented in 1689, by Lord Dartmouth, to whose son he had been tutor. He gave up Tewing in 1703, on being presented to the vicarage of Deptford St. Nicholas. He commenced D.D. in 1697. In 1701 he was appointed Dean of Canterbury. He was chaplain to King William and Queen Anne, and had a share in the education of the Duke of Gloucester, the heir presumptive to the crown. He wrote several works, chiefly translations or compilations. His principal work is his 'Paraphrase and Comment on the Epistles and Gospels as they are read in the Book of Common Prayer.' This was written originally for the special use of the Duke of Gloucester. He died in 1728.

STANHOPE, JAMES STANHOPE, EARL, the eldest son of the Hon. Alexander Stanhope, second son of Philip Stanhope, first earl of Chesterfield, was born in 1673. In 1699 he accompanied his father, who was sent as envoy by King William to Spain; and afterwards made the tour of France and Italy.

He embraced the military profession, and served first under the Duke of Savoy, and then under King William, in Flanders, in the war against France. Young as he was, William was so much struck with his spirit and talent, that in 1694 he gave him a captain's commission in the foot-guards, with the rank of lieutenant-colonel. He was wounded at the siege of Namur in 1695.

He appears to have been first returned to parliament for the borough of Cockermouth, at the general election in Sept. 1702; and he continued to be a member of the House of Commons from this time till his elevation to the peerage. For some years however he appears to have taken

little or no part in the proceedings of the House. In 1702 he went as a volunteer on the expedition to Cadiz; and in 1703 he proceeded to Portugal, and served under the Duke of Schomberg till he was forced to surrender with his regiment at discretion. But soon afterwards we find him serving again under the Earl of Peterborough, in whose brilliant Spanish campaign of the year 1705 he greatly distinguished himself. After the capture of Barcelona, in September of that year, he was sent home with despatches from Charles III.; and early in 1706 he was sent back by Queen Anne as envoy extraordinary to his Spanish majesty. In 1707 he was made major-general; and in 1708 appointed commander-in-chief of the British forces in Spain. That same year he captured Port Mahon and reduced the island of Minorca. In 1710 he gained the battles of Almanara, July 17, and Saragossa, Aug. 9; but on Nov. 27, he and the forces under his command, amounting to 2000 men, were surprised and attacked by the Duke of Vendôme at Brihuega, and after a gallant defence, forced to surrender themselves prisoners of war.

This terminated his military career. He was set at liberty, with the other prisoners on both sides, at the termination of the war; and he immediately took an active part in politics on the side of the Whig party. He was one of the managers for the Commons on the trial of Sacheverell, in the beginning of 1710. He and his friends also directed their attacks against the commercial treaty with France.

Soon after the accession of George I. he was appointed one of the principal secretaries of state (Sept. 24, 1714), Viscount Townshend being the other. But it was not long before intrigue and disunion crept in among the persons who had obtained possession of the government. The result was, that about the middle of April, 1717, the cabinet was reconstructed by the Earl of Sunderland being made secretary of state, with Addison for his colleague; and Stanhope filled the post of first lord of the treasury along with that of chancellor of the exchequer. Even this however was only an interim arrangement; in July following Stanhope was created Baron Stanhope, of Elvaston, and Viscount Stanhope, of Mahon in the island of Minorca; and in March, 1718, he took the office of secretary, and Sunderland that of first lord of the treasury, Mr. Aislabie being appointed chancellor of the exchequer. A few weeks afterwards Stanhope was made an earl by the title of Earl Stanhope. That same year he proceeded first to Paris and thence to Madrid, to endeavour to avert hostilities with Spain, an attempt in which he did not succeed; and he was afterwards more than once employed in similar negociations abroad. His death was very sudden. While speaking with much vehemence in the House of Lords he burst a blood-vessel, and died the next day, Sept. 5, 1721.

A correspondence between his lordship and the Abbé Vertot has been printed: 'Memorial to the Abbé Vertot concerning the Constitution of the Roman Senate, with the Abbé's Answer,' London, 1721, 4to.

STANHOPE, CHARLES, EARL, was born in August, 1753. He was the eldest son of Philip, second Earl Stanhope. On the death of his father, in 1786, he succeeded to the peerage.

It is to his mechanical inventions that Earl Stanhope principally owes his celebrity. He conferred on mankind an important benefit by the invention of the Stanhope Printing Press. He also made some improvements in the process of stereotype printing; in the construction of locks for canals; and among the lighter efforts of his mind may be ranked the invention of an ingenious machine for performing arithmetical operations.

During great part of his life he had studied the action of the electric fluid; and in 1779 he made public his theory of what is called the returning stroke. He imagined that when a large cloud is charged with electricity, it displaces a considerable portion of that fluid from the stratum of air in its neighbourhood; and he considered that, on the discharge of the cloud, the electric matter returns into the portion of the atmosphere from which it had been driven.

Earl Stanhope was a decided opponent of the ministry of the day; and was far in advance of the rest of his class in liberal principles. He wrote a reply to Mr. Burke's 'Reflections on the Revolution in France;' a refutation of a 'Plan for a Sinking Fund,' which had been proposed by Dr. Price; and an 'Essay on Juries.' He died in 1816.

STANHOPE, PHILIP DORMER. [CHESTERFIELD, EARL OF.]

STANISLAUS LESZCZYNSKI (commonly written *Leczinski*), king of Poland, and duke of Lorraine, was born in 1677. He was the last branch of one of the most ancient and distinguished families in Poland; his father Raphael Leszczynski having been grand treasurer of that kingdom. He received an excellent education, and was elevated to the dignity of a palatine of Posen at the early age of twenty-three. After the expulsion of Augustus II., elector of Saxony, from the throne of Poland, Leszczynski was elected king by the diet, on the recommendation—which amounted almost to a command—of Charles XII. of Sweden. Between his election and coronation he had experienced a temporary reverse, and was nearly taken by the troops of Augustus, who surprised Warsaw, and compelled Stanislaus to fly with his family from the capital. The arms of Charles XII. soon compelled Augustus to abdicate, and Stanislaus appeared to be firmly seated on the throne of his country. But the reverse of Pultawa changed the state of affairs, and Augustus recovered the throne. Stanislaus retired to the Swedish dominions, and afterwards went to Turkey, in order to induce Charles XII. to accede to a peace, of which his own abdication was one of the principal conditions. He was arrested by the Turkish authorities, but treated with the honours due to his station. After some time he was permitted to depart, and he retired to the principality of Deuxponts, which was the family estate of Charles XII., and the revenues of which were assigned by him to Stanislaus. His daughter Maria became queen of France in 1723, a circumstance which improved his position. In 1733, after the

death of Augustus II., he was elected for the second time king of Poland; but the influence of Russia and Austria opposed to him Augustus III. of Saxony, who was elected by a small minority, but supported by a Saxon and Russian army. Stanislaus was obliged to leave Warsaw, and to retire to Danzig, where he was besieged by Russian and Saxon troops. Stanislaus left Danzig in disguise, and escaped from his enemies. By the treaty of Vienna (1736) between Austria and France, Stanislaus was invested with the possessions of the duchies of Lorraine and Bar, retaining the title of king of Poland. He died in 1766, at the age of 89, in consequence of an accident, his clothes having taken fire when he was standing near a chimney. He left some productions in Polish and French. Those in French appeared in 4 vols. at Paris, in 1765, under the title of 'Œuvres du Philosophe Bienfaisant.'

STANISLAUS AUGUSTUS, the last Polish king, was the third son of Count Stanislaus Poniatowski. He was born Jan. 17, 1732, at Wolczyn, an estate in Lithuania, and received a very careful education. He was of an exceedingly prepossessing exterior; and improved the advantages received from his education by his travels in the principal parts of Europe. In St. Petersburg he made himself conspicuous by his intrigue with the grand-duchess of Russia, afterwards Catherine II. It was to the influence of this imperious woman that, after the death of Augustus III. in 1763, he owed his election to the throne of Poland; neither his birth nor position giving him any pretensions to that dignity. But his elevation was of short duration. His Russian partialities caused great discontent; and his efforts to remove the civil disabilities of the Lutherans and Calvinists, and to introduce some modification into the Polish Constitution—which had been previously reformed by the Czartoryski family—raised a powerful party against him. The Catholic Confederates at Bar declared the throne vacant, and the king's person was seized, Nov. 3, 1771.

When the final dismemberment of Poland was effected, Stanislaus retired for some time to the town of Grodno in Lithuania, where he signed his abdication. He was then transferred to St. Petersburg, and a large pension was assigned him by the emperor Paul. He died at St. Petersburg in 1798.

The last of the Poniatowskis who supported the honour of that name was Prince Joseph. [PONIATOWSKI, JOSEPH, PRINCE.]

STANLEY. [PERTHSHIRE.]

STANLEY, THOMAS, the son of Sir Thomas Stanley, was born in 1625, at Cumberlow in Hertfordshire. Thomas was educated at home during the first fourteen years, under the tuition of Fairfax, the translator of Tasso. He applied himself with great zeal to the study of the ancient languages, and also acquired great facility in reading French, Italian, and Spanish. In 1639 he was accompanied by his tutor to Cambridge, where he entered Pembroke Hall. The first time that he made his appearance as an author was in 1649, with a volume of Poems and Translations. About the same time he translated several French, Italian, and Spanish poems into English. Of his 'History of Philosophy,' the first edition appeared in three parts, from 1655 to 1662, folio, and was dedicated to his uncle John Marsham. The title is, 'The History of Philosophy, containing the Lives, Opinions, Actions, and Discourses of the Philosophers of every Sect.' A second edition appeared in 1687, folio; a third in 1701, folio; and the fourth and last, London, 1743, 4to. Stanley's 'History of Philosophy' was certainly at the time a great production, which excelled all that had been done before him in this department.

After the completion of his 'History of Philosophy,' Stanley devoted most of his time to the study of the Greek poets, more especially to Æschylus. In 1663 (some editions bear on the title-page the date 1664) he published the tragedies of Æschylus, with a Latin translation, an explanatory commentary, the Greek scholia, and the fragments, in one vol. folio. This edition has no great critical value. It was reprinted with some improvements by S. Butler, Cambridge, 1809, &c. After the publication of his Æschylus, Stanley began an extensive commentary on Æschylus. This work, on which he spent the greater part of the last years of his life, has never been published. The manuscript, consisting of eight volumes folio, is preserved in the public library at Cambridge. Stanley died in London, April 12, 1678.

STANLEY, JOHN, was born in 1713. Two years after his birth, he became blind, owing to an accident. At the age of seven he began to learn music as an amusement, in which he was instructed by Reading (composer of 'Dulce Domum'), and evinced such extraordinary aptitude for the art, that it was soon converted into a profession. The sightless boy now became the pupil of Dr. Greene, under whom he made such rapid advances, that at the age of 11 he was appointed organist of All-Hallows, Bread Street, London, and at 13 was elected to a similar situation in St. Andrew's, Holborn. In 1734 the benchers of the Middle Temple chose him as one of their organists, and this with St. Andrew's he held till his decease. On the death of Dr. Boyce, 1779, Mr. Stanley succeeded him as Master of the King's Band. During many years Mr. Stanley carried on the Lent Oratorios at Drury Lane Theatre in conjunction with Mr. Smith and Mr. Linley. [LINLEY.] These he conducted in person, accompanying all the songs, choruses, &c., with an accuracy that the ablest musician, in full possession of the sense of vision, could not have exceeded. He died in 1786. His compositions were numerous, and chiefly of the vocal kind; but he wrote many voluntaries for the organ, which long continued popular.

STANNARY, from the Latin *stannum*, 'tin.' This term sometimes denotes a tin-mine, sometimes the tin-mines of a district, sometimes the royal rights in respect of tin-mines within such district. But it is more commonly used as including the tin-mines within a particular district, the tinners employed in working them, and the customs and privileges attached to the mines, and to those employed in digging and purifying the ore.

The great stannaries of England are those of

Devon and Cornwall, of which the stannary of Cornwall is the more important. The stannaries of Cornwall and Devon were granted by Edward III. to the Black Prince, upon the creation of the duchy of Cornwall, and are perpetually incorporated with that duchy. In general both stannaries are under one duchy-officer, called the lord-warden of the stannaries, with a separate vice-warden for each county. The stannary of Cornwall is subdivided into the stannary of Blackmore, in the eastern parts of the county, and the stannaries of Tywarnhaile, Penwith, and Helston, in the west.

All tin in Cornwall and Devon, whoever might be the owner of the land, appears to have formerly belonged to the king, by a usage peculiar to these counties. King John, in 1201, granted a charter to his tinners in Cornwall and Devonshire, authorising them to dig tin and turves to melt the tin anywhere in the moors and in the fees of bishops, abbots, and earls, as they had been used and accustomed. This charter was confirmed by Edward I., Richard II., and Henry IV. In Cornwall the right of digging in other men's land is now regulated by a peculiar usage, called the custom of *bounding*. This custom attaches only to such land as now is or anciently was *wastrel*, that is, land open or uninclosed.

As part of the stannary rights, the Duke of Cornwall, as guarantee of the crown, has or had the pre-emption of tin throughout the county, a privilege supposed to have been reserved to the crown out of an original right of property in tin-mines, but in modern times it is never exercised.

The duties payable to the Duke of Cornwall on the stamping or coinage of tin were abolished by 1 & 2 Vict. c. 120, and the stannary courts were remodelled by 6 & 7 Wm. IV. c. 106. Further regulations for these courts have been introduced by 2 & 3 Vict. c. 58.

STANZA (*Stance* in French), an Italian word which means room or dwelling-place, is used in poetry to designate certain parts or divisions of a poem, each forming a complete period within itself, and consisting of a number of lines regularly adjusted to each other. There is great variety of structure in the stanzas of modern languages, in the rhythm, the rhymes, the number of syllables, and the number of lines.

STANZIO'NI, MA'SSIMO, Cavaliere, was born at Naples in 1585. He was the pupil of Caracciolo, but became afterwards the imitator of the great Bolognese painters, especially Guido Reni. There are several excellent works by Stanzioni in the church of the Certosa, now an hospital, at Naples, especially the picture of St. Bruno presenting the rules of his order to his monks. Stanzioni died at Naples in 1650.

STAPEL, JOHN BODÆUS A, a Dutch physician, and distinguished as a botanist. He was born at Amsterdam in the beginning of the 17th century, where his father practised as a physician. He finished his education at the university of Leyden, where, under the tuition of Vorstius, he acquired a taste for botany; and, in conjunction with this science, he applied himself to the study of the Greek language for the purpose of publishing a complete edition of the botanical works of Theophrastus. In the midst however of his studies and preparations for his great work, he died at an early age in 1636. He left materials enough for his father to publish an edition of the ten books of Theophrastus, 'De Historiâ Plantarum.' This work was published at Amsterdam in 1644, and exhibits great industry, being perhaps one of the most laborious editions of Theophrastus ever published.

STAPE'LIA, the name of an extensive and curious genus of African plants belonging to the natural order *Asclepiadaceæ*. Most of the species of this genus are natives of the Cape of Good Hope. The great diversity in the form, colour, size, and structure in the flowers of these plants, have afforded the means of distinguishing a large number of species, but the whole have a family likeness which is possessed by few genera. *S. hirsuta*, Hairy Stapelia, or Carrion-Flower. The whole flower is the size of a French rose. The smell of this plant is so like that of carrion, that flesh-flies deposit their ova in the flower, and when the maggots are produced they are starved for want of food. *S. pulvinata*, Cushion-Flowered Stapelia, is the most elegant of the species, and, notwithstanding its unpleasant odour, the Dutch natives of the Cape call it the Arabian Rose.

STAPHYLEA, the name of a genus of plants, the type of the natural order *Staphyleaceæ*. This genus has six species, of which one is a native of Europe, one of North America, one of Japan, two of Jamaica, one of Peru, and one of the Himalaya. *S. pinnata*, common Bladder-Nut, is a native of woods and thickets in the middle and south of Europe. It is admitted into the British flora on the ground of its occurring occasionally in hedges and thickets in Yorkshire. It is frequently planted in shrubberies as an ornamental shrub, for which it is well adapted. *S. trifolia*, Three-Leaved Bladder-Nut, is the species of North America, where it is found on dry hills in rocky situations from New York to North Carolina. It is also frequently cultivated as an ornamental shrub. *S. Emodi* is an Indian species: it was found by Dr. Royle on the Himalayas at an elevation of 7000 feet.

STAPHYLEA'CEÆ, a small natural order of plants belonging to the syncarpous group of polypetalous Exogens. There are only three genera and ten species belonging to this order, which are inhabitants of the warmer and temperate parts of the earth. Only one species, the *Staphylea pinnata*, is found in Europe. The species do not possess active properties. The seeds of all contain a mild oil, which may be expressed.

STAPHYLO'MA, is an affection in which some part of the eyeball is protruded beyond its natural position. It may exist in either the cornea or the sclerotica, and, according to its seat, is named *S. Corneæ* or *S. Scleroticæ*. Its treatment, of which the main object is to prevent the increase of the protrusion, and to relieve the pain to which the distension of the diseased parts gives rise, must vary with the circumstances of each case: the extreme measure is the removal of the protruded portion of the cornea.

STAPLE, 'anciently written *estaple*, cometh,'

says Lord Coke, 'of the French word *estape*, which signifies a mart or market.' It appears to have been used to indicate those marts both in this country and at Bruges, Antwerp, Calais, &c., on the Continent, where the principal products of a country were sold. The staples were confirmed or appointed in England by the king. (2 Edw. III., c. 9.) All merchandise sold for the purpose of exportation was compelled either to be sold at the staple, or afterwards brought there before exportation. This was done with the double view of accommodating the foreign merchants and also enabling the duties on exportation to be more conveniently and certainly collected. Afterwards the word staple was applied to the merchandise itself which was sold at the staple. The staple merchandise of England at these early times, when little manufacture was carried on here, is said by Lord Coke to have been wool, woolfells or sheepskins, leather, lead, and tin. Incident to the staple was a court called 'the court of the mayor of the staple.' This court was held for the convenience of the merchants, both native and foreign, attending the staple. It was of great antiquity; the date of its commencement does not appear to have been certainly known. Many early enactments exist regulating the proceedings at the staple and the court held there. Most of these were passed during the reigns of the two Edwards, the first and third of that name. The first enactment of importance is called the Statute of Merchants, or the Statute of Acton Burnel, and was passed in the 11th year of Edw. I., A.D. 1283. [ACTON BURNEL, STATUTE OF.] The statute passed in the 27th year of Edw. III. cap. 2, is entitled the Statute of Staple. One object of it was to remove the staple, previously held at Calais, to various towns in England, Wales, and Ireland, which are appointed by the statute. The statute directed proceedings similar to those prescribed for obtaining a Statute Merchant by means of a sealed recognisance, in consequence of which execution might be obtained against the lands and tenements of the debtor in the same manner as under a Statute Merchant.

A variety of other statutes were passed in the same and succeeding reigns, in some respects confirming, in others altering the provisions of the leading statute. As commerce became more extended, the staples appear to have fallen into disuse. Lord Coke, a great worshipper of antiquity, complains that in his time the staple had become a shadow.

STAR, DOUBLE STAR, CLUSTER OF STARS, NEBULA. We distinguish the stars from the planets in much the same way as our ancestors did before us, though there is hardly one point of difference which is now left to its full extent.

Independently of relative position, the stars are distinguished by their colour and quantity of light, on which last in a great degree depends their apparent magnitude. A casual observer would hardly think that there was any difference of colour between one and another; but a little practice shows that a tinge of one or another colour predominates a little in the nearly white light which all the stars have in common; and a good telescope gives some stars an appearance which observers have not scrupled to call 'blood-red.' But when we look at a star, we must remember that we see only the result of the treatment which its light has received from the atmosphere; and with a telescope the matter is in some respects worse, for there is no object glass which forms anything like a real image.

The magnitude of a star is a notion formed by observers as to the apparent quantity of light which comes from them, on which they are divided into classes. Those which are visible to the naked eye are usually divided into six magnitudes, which according to W. Herschel, emit quantities of light which are (roughly) in about the proportions of the numbers 100, 25, 12, 6, 2, and 1. The magnitudes of stars are rather indeterminate after the first and second. An astronomer would hardly say that an appearance was like a star of the 'first or second' magnitude. The difference of the two is too well established, though as to the fainter stars of the first magnitude, and the brighter ones of the second, there may be little to choose between them. But it is very common to speak of an appearance as being of the 'second or third,' 'third or fourth,' &c. magnitude.

Some stars (perhaps all) are variable in their magnitudes, and with periodical regularity, which is perhaps to be attributed to the effect of revolution round their axes.

Of these the most remarkable are those which (for a time) disappear altogether. The permanent disappearance of stars occurs every now and then, though there may in most cases be a question whether the star itself which has disappeared ever existed otherwise than as a wrong entry in a catalogue. There are however a few instances in which a sudden appearance of a new star is recorded, followed, after a time, by its disappearance. Such a phenomenon made an astronomer, it is said, of Hipparchus; and certainly the star which appeared in Cassiopeia in 1572 was the introduction of Tycho Brahé to the character of a public astronomer.

When observations of a star, made at two different periods, have been cleared of the effects of aberration and refraction, the only difference between the two places ought to be that due to precession and nutation, and any change of place which is not deducible from the latter is either error of observation, some unknown motion of the earth, or motion proper to the star. If the first be impossible or exceedingly unlikely, and if the same sort of discrepancy is found not to affect other stars, so that the second is not admissible, there remains only the third supposition. For example there is a large number of stars which certainly have a slight apparent motion not attributable either to precession or nutation. It might first strike an investigator that this change might arise from a motion of the solar system in space, the effects of which might be perceptible on some stars and not on the rest, on account of the much greater nearness of the former to our system. This supposition has of late years excited much attention, and much has been done

towards the establishment of the hypothesis that our sun and all the other stars are in motion about some central sun or central point. At the same time the actual distance of some stars from our own system has been ascertained. It has been reasonably supposed that those which have most motion are comparatively near to the earth, and when it was requisite to choose a double star for the determination of the question of parallax, 61 Cygni was selected, as being a star with a large proper motion; in fact, its right ascension alters yearly 5″.46, and its declination 3″.19. The experiment turned out favourably, and the parallax was discovered, and with it (roughly) the distance of the star from the solar system. And though light takes more than ten years to travel from this star to the earth, at the rate of two hundred thousand miles a second, yet so far from this being anything enormous, it rather cuts down the idea which was entertained of the distance of these bodies.

The particular objects which are seen in the heavens are *Stars*, simple points of light, and *Nebulæ*, patches of an appearance of cloudy light. Single stars, under the telescope, very frequently become double, triple, quadruple, or even a large cluster. Nebulæ are in some cases found to consist entirely of stars, but many remain which either are not composed of stars, or will not show themselves as such to the power of our present telescopes.

When two stars are so close together that the naked eye shows them only as one, it is possible that the coincidence may be merely optical: that is, that the lines of their directions may be so close as to make an apparent coincidence, such as takes place between the sun and moon in an eclipse of the former, though the real distances may be very great. Such optical coincidence is suspected in various double stars, but only a long course of observation can settle the suspicion in either way. But it is now found that many double stars are connected with each other by the law of gravitation, each revolving in an ellipse about their common centre of gravity, and showing every evidence of each being retained by the other, according to the Newtonian law of gravitation.

It is as difficult to say where the subject of nebulæ should begin as it is impossible to prophesy where it will end. Clusters of stars, which are visibly clusters to the naked eye, are found in different parts of the heavens, of which we suppose it must be assumed that they belong to the great stratum in which our system is situated. There are clusters of stars which are not such to the naked eye, but take that character in telescopes of the most moderate power; there are others again, of more and more difficulty, or requiring better and better telescopes to resolve them into clusters, some of which are visible to the naked eye as nebulæ, or slight cloudy patches of light. Many of them, when resolved into clusters, exhibit their thousands and millions of stars, increased in closeness and collective effect from the borders to the centre. Lastly, there are nebulous appearances which remain nebulous under the best telescopes yet constructed; but whether these are really clouds of luminous matter, or whether better telescopes would resolve them also into stars, is of course undecided.

William Herschel's subdivision of these objects is into—1, *Clusters*, subdivided into globular and irregular; 2, *Resolvable Nebulæ*, suspected of being one day reducible to clusters by better telescopes; 3, *Nebulæ*, which give no appearance of stars; 4, *Planetary Nebulæ*, with round discs and equable light; 5, *Stellar Nebulæ*, round, with increasing brilliancy towards the centre; 6, *Nebulous Stars*, sharp and brilliant stars surrounded by discs of faint light. But this is only a first approximation to a classification. Sir John Herschel has added *Annular Nebulæ*, presenting the appearance of a ring; *Long Nebulæ*, presenting the appearance of elongated ellipses of light; *Double Nebulæ*, or nebulæ very close together in the manner of double stars. He has also remarked the frequent occurrence of stars very near to planetary nebulæ, which he suspects to be real satellites.

With respect to the way of naming the stars, the boundaries of the constellations are so ill defined, the ways in which the description of catalogues clash with each other are so numerous, and the points on each of which there should be, and is not, common consent, increase so fast, that unless a remedy be applied, a limit can be foreseen to the diffusion, and perhaps even to the progress, of sidereal astronomy. One constellation will sometimes contain an isolated portion of another, just as a county or diocese sometimes actually surrounds a parish which belongs to another. Stars occur under different names. Some catalogue-stars have never existed, or owe their creation to a wrong entry or a mistake in reading an instrument. Constellations are recognised by some astronomers and not by others, while the same names are repeated in different parts of the heavens. These defects are most conspicuous in the southern hemisphere.

STAR-APPLE. [Chrysophyllum.]

STAR-CHAMBER. The Star-Chamber is said to have been in early times one of the apartments of the king's palace at Westminster which was used for the despatch of public business. The Painted Chamber, the White Chamber, and the Chambre Markolph were occupied by the triers and receivers of petitions, and the king's council held its sittings in the Camera Stellata, or Chambre des Estoylles, which was so called probably from some remarkable feature in its architecture or embellishment. Whatever may be the etymology of the term, there can be little doubt that the court of Star-Chamber derived its name from the place in which it was holden.

The judicature of the court of Star-Chamber appears to have originated in the exercise of a criminal and civil jurisdiction by the king's council, or by that section of it which Lord Hale calls the *Concilium Ordinarium* in order to distinguish it from the *Privy Council*, who were the deliberate advisers of the crown. This exercise of jurisdiction by the king's council was considered as an encroachment upon the common law,

and being the subject of frequent complaint by the Commons, was greatly abridged by several acts of parliament in the reign of Edward III. It was discouraged also by the common-law judges, although they were usually members of the council; and from the joint operation of these and some other causes the power of the Concilium Regis as a court of justice had materially declined previously to the reign of Henry VII. A court which was enacted by statute of the 3 Henry VII. c. 1 was probably not the Court of Star-Chamber; for it seems that this court by statute fell into disuse after the middle of the reign of Henry VIII.; that the court of Star-Chamber was the old *concilium ordinarium*, against whose jurisdiction many statutes had been enacted from the time of Edward III.; and that no part of the jurisdiction exercised by the Star-Chamber could be maintained on the authority of the statute of Henry VII. At the beginning of the reign of Elizabeth the court of Star-Chamber was unquestionably in full operation, in the form in which it was known in the succeeding reigns; and at this period, before it had degenerated into a mere engine of state, it was by no means destitute of utility. It was the only court in which great and powerful offenders had no means of setting at defiance the administration of justice or corrupting its course. And during the reign of Elizabeth, when the jurisdiction of the Star-Chamber had reached its maturity, it seems, except in political cases, to have been administered with wisdom and discretion.

The proceedings in the Court of Star-Chamber were by information, or bill and answer. Interrogatories in writing were also exhibited to the defendant and witnesses, which were answered on oath. The attorney-general had the power of exhibiting ex-officio informations. In cases of confession by accused persons, the information and proceedings were oral; and hence arose one of the most oppressive abuses of the court in political prosecutions. The proceeding by written information and interrogatories was tedious and troublesome, often involving much nicety in pleading, and always requiring a degree of precision in setting forth the accusation, which was embarrassing in a state prosecution. During the last century of the existence of the Star-Chamber, enormous fines, imprisonments for life or during the king's pleasure, banishment, mutilation, and every variety of punishment short of death were often inflicted by a court composed of members of the king's council, upon a mere oral proceeding, without hearing the accused, without a written charge or record of any kind, and without appeal.

The civil jurisdiction of the Star-Chamber comprehended mercantile controversies between English and foreign merchants, testamentary causes, and differences between the heads and commonalty of corporations, both lay and spiritual. The criminal jurisdiction of the court was very extensive. If the king chose to remit the capital punishment, the court had jurisdiction to punish as crimes even treason, murder, and felony. Under the comprehensive name of contempts of the king's authority, all offences against the state were included. Forgery, perjury, riots, maintenance, embracery, fraud, libels, conspiracy, and false accusation, misconduct by judges, justices of the peace, sheriffs, jurors, and other persons connected with the administration of justice, were all punishable in the Star-Chamber.

A measure which was introduced into the House of Commons in the last parliament of Charles I., to limit and regulate the authority of this court, terminated in a proposal for its entire abolition, which was adopted without opposition in both Houses (stat. 16 Car. I., c. 10).

STAR-FISH. [ASTERIAS.]

STAR FORT, a kind of redoubt enclosing an area, and having its lines of rampart or parapet disposed, on the plan, in directions making with each other angles which are alternately salient and re-entering, as a star is usually represented. This construction is adopted when the work is intended to contain, for some time, the stores of an army, or to secure some important part of the position which the army occupies.

That the fire of musketry may be sufficiently effective, it is considered proper that the lengths of the several faces should not be less than thirty yards; and a star-fort whose faces are of much greater length is capable of containing a garrison more numerous than that which would be required for the end proposed by such a work. A star-fort with six or eight points has a great advantage over a simple redoubt, though its construction is less simple; the crossing fires from the faces seriously impede the advance of the enemy towards the salient points; and the assailants, in passing the ditch, are completely exposed to the view of the defenders.

During the Seven Years' War the King of Prussia's intrenched camp at Jauernick contained a star-fort on a rising ground in its centre, from whence the movements of the Austrians could be observed. The position taken up on the Nivelle by Marshal Soult, while the British army was acting in the south of France (1813), was protected by a strong star-fort; the work was constructed on a terrace below the summit of a mountain called the Smaller Rhune, and was intended to defend the entrance of a ravine. A platform below the summit of a ridge of high ground near the Bidassoa was, in like manner, fortified by a star-fort.

STARCH (called also *Farina* and *Fæculum*) is a proximate principle of plants, chiefly found in the seeds of corn and pulse, in many kinds of tubers, and sometimes in wood, bark, and leaves. In all these instances it is associated with other principles, which are either employed with it, or separated by different processes, according to the use intended to be made of it. In wheat it is associated with variable proportions of gluten, sugar, and gum; in potatoes, chiefly with gum and sugar. It is mostly lodged in the cells of the cellular tissue, and consists of granules, always white, generally of a roundish and seldom of an angular figure. The granules differ in size, often in the same seed, being generally smallest near the circumference. They differ also in different plants. The granules are lodged mostly

in the cells or compartments of the cellular tissue; and each granule consists of a membrane, containing a transparent colourless material resembling gum. In the process of germination of seeds, and the sprouting of potatoes and other tubers, the membrane is ruptured by the development of a principle termed *diastase*, and the contents rendered available for the growth of the plant.

The insolubility of the membrane in cold water affords a means of separating the starch from the gluten in wheat-flour, and from the fibrous matter in potatoes and other tubers. Wheat-flour is formed into a paste with water, and then kneaded under a stream of water so long as the water runs off of a milky appearance; what remains behind is chiefly gluten, while the water has carried off the starch suspended in it; and gum, sugar, and some phosphatic salts, either dissolved or suspended in it. The water charged with these matters is permitted to stand for a few days in summer, but for a week or two in winter, to allow the acetous fermentation to occur, by which the sugar and other principles are got rid of. The acid liquor termed *Sours* is drawn off, and the starch thrown upon sieves, and washed; the bran and other impurities are retained on the sieves, while the starch is carried forward into large vessels called *Frames*. In these the starch subsides, and the water, which has become perceptibly sour, drawn off, and the *Slimes* removed. The starch is then washed, passed through a sieve, and finally allowed to subside. Thus purified it is put into boxes lined with canvass and perforated with holes, by which the superfluous water escapes. Afterwards it is cut into squares, put on bricks, and exposed to the heat of an oven, where it splits into irregular prisms. When free from any artificial admixture, it is perfectly white, and termed White Starch or French Starch; but in general, azure (smalt) or indigo is added, when it is employed for stiffening linen, to which it imparts a more agreeable hue than the dull white of that material.

Starch, when pure, is nearly devoid of odour and taste. The best bread is formed by flour which contains the greatest proportion of gluten. The relative proportions of starch and gluten differ not only in the different cereal grains, but in the same species or variety, according to the season when they are sown, or the manure which has been applied to the land. Starch exists in larger proportion in Carolina rice than in any other grain. Potatoes yield the purest starch, variable in quantity with the kind of potato used, the mode of cultivation, the time of setting, and, above all, the time of year when the process is applied.

Starch is most extensively used in the arts, but it is little employed in medicine, except for its demulcent properties, and as a vehicle for opiate injections.

STARGARD. [Danzig; Stettin.]

STARK, WILLIAM, M.D., was born at Birmingham in 1740, and educated for the medical profession, first at Glasgow, and then successively at Edinburgh, London, and Leyden, at which last place he took his degree in 1767. Returning to London in 1769, he commenced the course of experiments on diet, of which the termination, rather than the scientific results, has rendered him celebrated. To ascertain the effects of different quantities and kinds of food upon the human economy, he confined himself for periods of from four to fourteen days to certain articles of diet, and carefully registered the influence which they seemed to exercise on the several functions of the body. His last plan (when his previous experiments had already rather disturbed his health) was to try the effects of a diet of bread or flour, with honey and infusion of tea or rosemary. After continuing this for ten days, it brought on diarrhœa and weakness, and to remedy the former he adopted a diet of bread, cheese, and infusion of rosemary. This produced a totally opposite state of the intestines, and was followed by low fever, with disturbance of the general health, and inflammation of the glands of the small intestines, of which, after five days' severe illness, he died. His works were published by Dr. J. Carmichael Smyth, in 1788 (in 1 vol. 4to., London): they include the 'Journal of his Experiments,' and his 'Clinical and Anatomical Observations,' which give proof of much acuteness in the study of disease.

STARLING. [Sturnidæ.]

STARS, SHOOTING. [Shooting Stars.]

STATEN ISLAND. [New York, viii., 935.]

STATER (*στατηρ, a standard* of value), or *Chrysus* (*χρυσοῦς, gold money*), was the name of a Greek gold coin, which, after being used from a very early period in some states, became, in the time of Philip II. and Alexander the Great, the general gold currency of Greece.

It is said to have been first coined in Lydia. The stater of Crœsus seems to have been the first gold money seen in Greece.

Of the better known gold coins, most were of the same standard of weight as the Attic drachma.

The average weight of the staters of Philip and Alexander is a little under 133 grains. Therefore this stater was a very little more than 1*l.* 3*s.* 6*d.* If we calculate its value by the number of drachmæ it was worth, we find it only 16*s.* 3*d.* The reason of this is that silver was much dearer in ancient times that it is now.

STATES GENERAL. This term is from the French *Etats Généraux*, the assembly of the three orders of the kingdom: the clergy, the nobility, and the third estate. The States General of France were convoked in 1614 under Louis XIII., and they did not meet again till 1785.

The memorable convocation of the States General of France in 1789 led to the Revolution. A dispute arose between the two privileged orders and the third estate (tiers état) about their mode of sitting and voting; and finally (17th June, 1789) the deputies of the tiers état with such deputies of the clergy as chose to join them, for none of the nobles accepted the invitation to join, assumed the name of the National Assembly.

The king Louis XVI. afterwards sanctioned the union of the three estates in one National Assembly. One of the early acts of the National Assembly was the publication of the 'Declaration of the Rights of the Man and the Citizen.' The

National Assembly continued its labours several months after the death of Mirabeau, 2nd April, 1791. In September, 1791, the Assembly presented to the king for his sanction the new constitution, which the king accepted, and the Assembly dissolved itself on the 30th of the same month.

The first National Assembly is generally called 'l'Assemblée Constituante,' from its having framed the constitution. The constitution lasted about twelve months, and was followed by the Republic.

STA'TICE, a genus of plants belonging to the natural order of *Plumbagineæ*. *S. Caroliniana* is a native of North America, where it is called the Marsh Rosemary. The root is a very powerful astringent, and is used as an application in aphthæ and similar affections of the mouth and fauces; it has been employed with success in Cynanche maligna. *S. Limonium*, Sea Lavender, is a British species. The roots possess astringent qualities. *S. rariflora* is found near the sea in England and the coast of Galloway in Scotland.

STATICS, a subdivision of mechanics, meaning the part of the science in which equilibrating forces are considered, in opposition to *Dynamics*, in which the effects of forces producing motion are investigated: it is subdivided into the statics of rigid and of fluid bodies, the latter being called *Hydrostatics*.

Statics, like all other mechanical sciences, is usually placed among mixed Mathematics. But the line which separates it from the pure sciences is almost imperceptible, and it would seem more reasonable to invent a third and intermediate distinctive term, than to place statics and electricity under the same name, to distinguish them from geometry.

STATIONARY (Astronomy). All the planets appear at the earth to move alternately forwards and backwards in the heavens, the retrograde motion not continuing so long as the direct motion. For a little time at the beginning and end of the retrogradation, the planet appears to have no motion. This arises when the relative motion of the planet is really towards the earth.

STATISTICS is that department of political science which is concerned in collecting and arranging facts illustrative of the condition of a people and the resources of a state. To reason upon such facts and to draw conclusions from them is not within the province of statistics; but is the business of the statesman and of the political economist.

STA'TIUS, P. PAPINIUS, was born at Naples, A.D. 61. His father was a grammarian and poet, and was much distinguished by the patronage of Domitian. The son was educated at Rome, and his early genius met with like encouragement from the Emperor. He gained the prizes in the poetical contests held at that time at Alba and elsewhere. His popularity is described by Juvenal ('Sat.,' vii. 82). In the year 80 A.D. he married Claudia, a widow, of whom he makes frequent and affectionate mention in his writings: having no issue by her, he adopted a son. Statius died at Naples, A.D. 96. He wrote the following works:—'Sylvæ,' a collection of 32 poems distributed in 5 books, on various subjects, such as passing events or passing thoughts would suggest. They are written chiefly in hexameters, and occasionally in the alcaic, sapphic, and other metres. The last book appeared in the last year of the author's life. 'Thebais,' an epic poem in 12 books, giving an account of the Theban war between Eteocles and Polynices: in this work he has borrowed much from Greek sources, and in particular from the 'Thebais' of Antimachus. 'Achilleis,' an unfinished epic poem in 2 books, the further progress of which was arrested by the death of the poet. The 'Sylvæ' are the most interesting of the poems of Statius. In them the poet's thoughts appear in the easy garb of private life, and his domestic feelings and affections are unaffectedly revealed. Many curious particulars illustrative of Roman manners may be gathered from this work. As an epic poet, Statius belongs to a school of later Roman writers, the successors and imitators of Virgil, and, like them, he is characterised by a learned obscurity of allusion, an unskilful use of metaphor, and a strained yet feeble mode of expression. The principal editions of Statius are—Edit. princ., 1470, Venet., 1483, fol.; Bernartius, Antwerp, 1595; ed. Fr. Tiliobroga (Lindenbrog), Paris, 1600, 4to.; rec. Crusius, Paris, 1618, 4to.; J. Fr. Gronovii, Amstel., 1653, 24mo., cum comment. ed. F. Hand., Lips., 1817, 8vo.

STATUARY. [SCULPTURE.]

STATUTE. Bills which have passed through the houses of Lords and Commons and received the royal assent become Acts of Parliament, and are sometimes spoken of collectively as forming the body of Statutes of the Realm. But a more restricted application of the word is generally in use, by which private acts of parliament are excluded, and even public acts when their purpose is temporary. The application is still more restricted when the measures of the early parliaments are the subject in question, for many acts passed and received the royal assent which belong to the class of public acts and are found at large on the Rolls of Parliament, which are not accounted statutes in the sense in which that word is ordinarily used.

No strict definition can be given of those results of the deliberations in parliament to which the king has signified his assent, which are now called the Statutes of the Realm. We may distinguish them from other enactments of early times, as follows: they were at a very remote period separated from the rest, written in books apart from the rest, and received by the courts of law as of equal authority with the ancient customs of the realm.

Three volumes, now in the custody of the Master of the Rolls, contain the body of those enactments which are called statutes. One volume contains the statutes passed before the beginning of the reign of Edward III.; and the other two, those from 1 Edward III. to 7 Henry VIII., all very fairly written. These may be considered as the manuscripts of the early statutes of superior value, if not of superior antiquity as to the earlier portions, to the many similar collections which are in the libraries of the inns of court, of the universities, of the British Museum, and in

some other depositories public and private. These numerous manuscript copies of the statutes are in substance pretty nearly the same, though some of these collections contain statutes which are not admitted into others. These books are not considered in the light of authorised enrolments of the statutes. For the authentic and authoritative copies, if any question arises, recourse must be had (1) to what are called the Statute Rolls at the Tower, which are six rolls containing the statutes from 6 Edward I. to 8 Edward IV., except from 8 to 25 Henry VI.; (2) to the enrolments of acts of parliament which are preserved at the Rolls Chapel from 1 Richard III.; (3) to exemplifications and transcripts with writs annexed, signifying that they were transmitted by authority to certain courts or other parties, who were required to take notice of them, of which many remain in the Exchequer and elsewhere; (4) in those since 12 Henry VII., to the original acts in the parliament office; (5) the rolls and journals of parliament; (6) the close, patent, fine, and charter rolls at the Tower; on which statutes are sometimes found.

With the parliament of the reign of Richard III. began the practice of printing, and in that manner publishing, the acts passed in each session. This followed very soon after the introduction of printing into England. Before that time it had been a frequent practice to transmit copies of the acts as passed to the sheriffs of the different shrievalties to be by them promulgated. The practice of printing the sessional statutes has continued to the present time.

Before the first of Richard III. the aid of the press had been called in to give extended circulation to the older statutes. Before 1481 it is believed that an abridgment of the statutes was printed by Letton and Machlinia, which contains none later than 33 Henry VI., 1455. To the next year is assigned a collection, not abridged, from 1 Edward III. to 22 Edward IV. Next to these in point of antiquity is a collection printed by Pynson about 1497, who also, in 1508, printed what he entitled 'Antiqua Statuta,' containing Magna Charta, Charta de Foresta, the Statutes of Merton, Marlbridge, and Westminster primum and secundum. This was the first publication of those very early statutes.

In the reign of Henry VIII. the first English abridgment of the statutes was printed by Rastall; and during that reign and in the succeeding half century there were numerous impressions published of the old and recent statutes in the original Latin and French, or in English translations. Barker, about 1587, first used the title 'Statutes at Large.' In 1618 two large collections of statutes, ending in 7 James I., were published, called Rastall's and Pulton's. Pulton's collection was several times reprinted with additions.

In the 18th century an edition, in six folio volumes, was published by Mr. Serjeant Hawkins in 1735, containing the statutes to 7 George II. Cay's edition, in 1758, in the same number of volumes, contains the statutes to 30 George II. Continuations of these works were published as fresh statutes were passed; and another work in 4to., of the same kind, was begun in 1762, known by the designation of Ruffhead's 'Statutes at Large.' Pickering's edition is in 8vo., and ends with 1 George III.

None of these collections were published by authority of the state. A committee of the House of Commons, who, in 1800, were appointed to inquire into the state of the Public Records, recommended, among other things, that 'a complete and authoritative edition of all the statutes should be published.' A commission was appointed for carrying into effect the recommendations of this committee, and between 1810 and 1824, they produced, in a series of large volumes, a critical edition of the statutes (including the early public charters), ending with the close of the reign of Queen Anne. This is what is now considered the most *authentic* edition of the statutes, and it is supplied with a valuable index. It forms ten folio volumes.

The statutes passed in the Imperial Parliament of Great Britain are printed by the queen's printers, in foolscap folio, and sold at the Act Office, in separate acts, at the rate of three halfpence a sheet (4 pages) for public acts and three pence a sheet for private acts. An 8vo. edition is also published, which is sold at the rate of one penny a sheet (16 pages 8vo.).

The statutes of the realm are generally divided into two classes—Public and Private; but they may more conveniently be distributed into three classes—Public General, Public Local, and Private. The two former only come within the term 'laws,' in the proper acceptation of the term. Private acts empower individuals to do certain acts, which otherwise they could not do; and they are not noticed in courts of law, unless they are pleaded. The Public Local statutes, though published separately, and though the standing orders of the Houses of Parliament require that on account of the private interests which they are often likely to affect, certain preliminary notices and other proceedings should take place before they are passed through their stages, are yet in the same position as the Public General Statutes. Formerly all the public statutes, local and general, were published together and numbered consecutively; but since 1798, the local acts have been separately enumerated in distinct volumes. By the 13 Vict., cap. 21, s. 6 (passed June 10, 1850), it is enacted, that from the commencement of the next session of parliament, every act passed is to be deemed and taken to be a public act, unless expressly declared to the contrary. The legislation of a session has generally filled one volume with general, and three or four with local statutes. The latter are not always the more numerous, but owing to the variety of matters which they comprehend, they are usually much longer than the general statutes. As, from the quantity of railway and other joint-stock schemes this branch of legislation is rapidly increasing, the means of simplifying and abbreviating it have occupied the attention of law reformers, and some steps have been taken to accomplish this end. It had been observed that there are some clauses that are or ought to be common to all local acts. In em-

bodying the matters which should be of the same character in every one of the local statutes, different draftsmen used different expressions; and the courts of law had on this account often to give a practically different effect to clauses which were intended to accomplish the same thing. During the session of parliament of 1845 an effort was made to remedy this defect in local legislation. Three public general acts were passed, of which the following are the titles: 'An Act for consolidating in one Act certain Provisions usually inserted in Acts with respect to the Constitution of Companies incorporated for carrying on Undertakings of a public Nature;' 'An Act for consolidating in one Act certain Provisions usually inserted in Acts authorising the taking of Lands for Undertakings of a public Nature;' and 'An Act for consolidating in one Act certain Provisions usually inserted in Acts authorising the making of Railways.' To prevent confusion, a distinct series of these acts was passed applicable to Scotland. In each of these Acts there is a provision that it shall have reference to all local acts for the undertakings to which it applies. 'And all the provisions of this Act, save so far as they shall be expressly varied or excepted by any such act, shall apply to the undertaking authorised thereby so far as the same shall be applicable to such undertaking; and shall, as well as the clauses and provisions of every other Act which shall be incorporated with such Act, form part of such Act, and be construed together therewith as forming one Act.'

As to the Scotch Statutes, see the article 'Statute (Scotland)' in the 'Penny Cyclopædia.'

STATUTE (*Ireland*). In Ireland, the method by which the early irregular convocations, called Parliaments, passed their acts, appears to have been a close imitation of the English practice. The authenticated printed statutes begin in the year 1310–3 Edw. II. After five short acts of this parliament there is a blank until the year 1429, although several parliaments were held in the interval. Many of these statutes are characteristic indications of the state of the country, and throw light on the domination of the English over the natives. The Statute of Drogheda, commonly called Poyning's Law, passed in 1495 (10 Hen. VII.), had a marked influence on the later legislation and constitutional history of Ireland. By chap. 22 it was enacted, that all the acts then or late passed in England, 'concerning or belonging to the common and public weal of the same,' should be law in Ireland. By chap. 4 it was provided, that no parliament should afterwards be held in Ireland until the lord-lieutenant and council had certified the king of the causes and considerations for holding it, and of the acts proposed to be passed at it, and a licence had been obtained from England accordingly. Thus no measure could be proposed for the adoption of parliament until it had first received the royal assent in England. It is believed that this badge of servitude prevented the passing of many exterminating acts, which, in troubled times, the Irish ministry, and their partisan-parliaments, would have readily passed. This act was repealed, and the independence of the Irish legislature restored by the measure of 1783. By the Act of Union, in 1800, the Irish Parliament was merged in the United Parliament of Great Britain and Ireland. [PARLIAMENT, IMPERIAL.]

STATUTE OF FRAUDS. This name is applicable to any statute the object of which is to prevent fraud, but it is particularly applied to the 29 Car II. c. 3, which is entitled the 'Statute of Frauds and Perjuries.' One object of the statute was to prevent disputes and frauds by requiring in many cases written evidence of an agreement. Before the passing of this statute, an estate in fee-simple could be conveyed merely by livery of seisin, accompanied with proper words, and a use could also be declared by parol. No writing was necessary to convey any estate in possession, for such estate is technically said to lie in livery; but a reversion could only be conveyed by deed. The Statute of Frauds declared that all leases, estates, and interests of freehold or terms of years or any uncertain interests in any lands or hereditaments, made by livery and seisin only, or by parol, and not put in writing and signed by the parties, &c., shall have the force of leases or estates at will only. But leases for not more than three years, whereon the rent reserved shall be two-thirds of the full improved value of the thing demised, are excepted by the statute. Further, no lease, estates, or interest, *either* of freehold or terms of years, or any uncertain interest, not being copyhold or customary interest, shall be assigned, granted, or surrendered except by deed or note in writing. Another section of the statute provides that all declarations or creations of trust or confidences of any land, tenements, or hereditaments shall be manifested and proved by some writing signed by the party who is by law enabled to declare such trust, or by his last will in writing, or they shall be void. The 5th section of this statute declared that all devises of lands or tenements, as more particularly described in this section, should be in writing, and signed in the manner here prescribed by three or four credible witnesses; and the 6th section related to the revocation of a devise in writing of lands or tenements. Both these sections are répealed by the last Wills' Act, 1 Vict. c. 26, which makes alterations in other provisions also of the Statute of Frauds.

There are several other important provisions in this statute, which may be omitted here, as the object is to show merely that the purpose of the statute is to prevent fraud by requiring the evidence of writing, which is a better kind of evidence than men's memory.

STATUTES OF LIMITATION. There appear to have been no times limited by the common law within which actions might be brought; for with the exception of the period of a year and a day, mentioned by Spelman ('Gloss.,' 32), as fixed for the heir of a tenant to claim after the death of his ancestor, and for the tenant to make his claim upon a disseisor, all the limitations of actions in the English law have been established by statute. Certain remarkable periods were first fixed upon, within which the cause of action must

have arisen. Thus in the time of Henry III., the limitations in a writ of right, which was then from the time of Henry I., was by the Statute of Merton, c. 8, reduced to the time of Henry II.; and by the Statute of Westminster I., c. 8, the period within which writs of right might be sued out was brought down to the time of Richard I. (Co. Lit., 114, b.)

As to Limitations of Actions and Suits relating to Real Property:—

The 21 Jac. I., c. 16, limited the period for all writs of formedon to twenty years; and it was enacted generally that no person should make entry into any lands, but within twenty years next after his right of entry accrued. The act contained a saving of the rights of certain persons therein enumerated.

By the 9 Geo. III., c. 16, the right of the crown to sue or implead for any manors, lands, or other hereditaments (except liberties or franchises) was limited to 60 years. Before this act, the rule that *nullum tempus occurrit regi* was universal; and it still prevails as a maxim of law, except where abridged by statute.

The next statute upon this subject is the important act of the 3 and 4 Wm. IV., c. 27, by which great changes were made in the remedies for trying the rights to real property, and which embodies the greater part of the present law of limitations relating thereto.

By section 2, no person can make an entry or distress, or bring an action to recover any land or rent, but within twenty years after the right to make such entry or distress, or bring such action, has accrued to the claimant, or some person through whom he claims. The meaning of the terms 'land,' 'rent,' and 'person,' is explained in the first section of this act. It is sufficient to state the general object of the act. The explanation of its particular provisions belongs to law treatises.

By section 36, all real and mixed actions, except Ejectment, and the actions of Dower and Quare Impedit, were abolished after the 31st of December, 1834.

Since the 31st day of December, 1833, no arrears of rent or of interest in respect of any money charged in any manner on land or rent, or any damages in respect of such arrear of rent or interest, can be recovered by any distress, action, or suit, but within six years next after the same respectively became due, or next after an acknowledgment in writing given to the person entitled thereto or his agent, signed by the person by whom the same was payable, or his agent; except where there has been a prior mortgagee or other incumbrancer in possession within one year next before an action or suit is brought by any person entitled to a subsequent mortgage or other incumbrance on the same land, in which case the arrears of interest may be recovered for the whole time during which such prior mortgagee or incumbrancer was in possession, though it exceed the term of six years (sect. 42). It seems that the above section refers to rents charged upon land only, to which it had been held that the former statutes did not apply, and not to conventional

rents (2 Bing., 'N. C.,' 688), the limitations as to which are provided for by the 21 Jac., c. 16, s. 3, and the 3 and 4 Wm. IV., c. 42, s. 3.

Limitations as to Tithes and other ecclesiastical property are now regulated by 2 and 3 Wm. IV., c. 100; and 3 and 4 Wm. IV., c. 27; and as to advowsons, by the 3 and 4 Wm. IV., c. 27, s. 30.

Limitations as to other incorporeal rights are now mainly regulated by 2 and 3 Wm. IV., c. 71.

As to Limitations of Personal Actions and Suits relating to Personal Property:—

1. Of Actions of Assault and Battery.

By the 21 Jac. I., c. 16, s. 3, all actions of trespass, of assault, battery, wounding, imprisonment, or any of them, must be commenced and sued within four years after the cause of action arises.

2. Of Actions of Slander.

By the 21 Jac. I., c. 16, s. 3, all actions on the case for words must be commenced and sued within two years next after the words spoken.

3. Of Actions arising upon Simple Contract, and Actions founded in Wrong.

By the 21 Jac. I. c. 16, s. 3, all actions of trespass *quare clausum fregit*, actions of trespass, detenue, trover, and replevin for taking away goods and cattle, actions of account and upon the case (except merchants' accounts), actions of debt grounded upon lending or contract without specialty, and actions of debt for arrearages of rent, must be commenced and sued within six years next after the cause of action arises.

Formerly there was no limitation applicable to a suit for a legacy, though in some cases presumption of payment was admitted; but the 3 and 4 Wm IV., c. 27, s. 40, which fixes the period of limitation to twenty years, is applicable to all legacies, whether charged on real estate or not.

The limitation as to arrears of rent in the statute of James does not apply to rents reserved by indenture.

To settle questions which arose upon the effect of subsequent promises and acknowledgments, it was enacted by 9 Geo. IV., c. 14, s. 1, reciting the act of James, that in actions of debt, or upon the case, grounded on any simple contract, no acknowledgment should be deemed sufficient, unless it were in writing, signed by the party chargeable thereby; and that where there were two or more joint contractors, or executors, or administrators of any contractor, the written promise of one or more of them should not bind the others.

As to Actions arising upon Specialty:—

Before the 3 and 4 Wm. IV., c. 42, there was no statutable limitation to actions upon specialties, though the courts held that payment was *primâ facie* to be presumed after twenty years. By the 3rd section of the above act actions of debt for rent upon an indenture of demise, actions of covenant or debt upon bond or other specialty, and actions of debt or *scire facias* upon recognisance must be commenced and sued within twenty years after the cause of such actions or suits arises. If the 3 and 4 Wm. IV., c. 27, s. 42, applies to actions on specialty, it is so far repealed by this act; but the better opinion seems to be that the former act applies to rents which

are a charge upon land only, and not to conventional rents, whether reserved by indenture or otherwise. (2 Bing.; 'N. C.,' 688.)

By section 5, it is provided, in accordance with the enactments of 9 Geo. IV., c. 14, as to actions on simple contract, that if any acknowledgment has been made, either by writing signed by the party liable by virtue of such indenture, specialty, or recognisance, or his agent, or by part payment, or part satisfaction, on account of any principal or interest then due thereon, the person entitled may bring his action for the money remaining unpaid, and so acknowledged to be due, within twenty years after such acknowledgment, or part payment; and in case of the plaintiff being under any of the disabilities mentioned in the 4th section of the same act, or absence of the defendant beyond seas at the time of such acknowledgment being made, then within twenty years of the removal of such disability, or the return of the defendant from beyond seas.

Limitations of Actions on Penal Statutes are provided for by the 31 Eliz., c. 5, s. 5 (which act repeals a previous one, the 7 Hen. VIII., c. 3, upon the same subject), and 3 & 4 Wm. IV., c. 42, s. 3.

By the 24 Geo. II., c. 44, s. 1, actions against justices of the peace and constables or others acting in obedience to their warrants are limited to six calendar months.

There is no time limited by any statute for indictments for felonies and other misdemeanors when there is no forfeiture to the queen or to the prosecutor, but the acts of general pardon which have been passed from time to time have the effect of limitations. The last of such acts was the 20 Geo. II., c. 52.

Of the Exceptions to the Operation of the Statutes of Limitation:—

The exceptions in the several statutes of limitation may be stated generally to comprehend infants and other persons under disabilities.

In cases of express trust, the statutes of limitation have no application as between trustee and cestuy que trust; and in cases of fraud they operate only from the time of the discovery of the fraud. If a debtor creates by his will a trust of real or personal estate for the payment of his debts, such a trust will prevent the statutes from operating upon a debt not barred at the time of the creation of the trust, that is, from the death of the testator.

A charity is never considered in equity as absolutely barred by the statutes, or by any rule of limitation analogous to them; but the court takes notice of a long adverse possession in considering the effect and construction of instruments under which claims are set up on its behalf. (2 J. and W., 321.)

By the 3 and 4 Wm. IV., c. 27, s. 43, persons claiming tithes, legacies, or any other property for the recovery of which an action or suit at law or in equity might have been brought, cannot bring a suit or other proceeding in any spiritual court for the same but within the period during which they might have brought their action at law or suit in equity. Also, by the 27 Geo. III., c. 44, s. 1, suits in the Ecclesiastical Court for defamatory words must be commenced within six calendar months, and (sect. 2) suits for fornication, incontinence, or for striking or brawling in a church or churchyard, must be brought within eight calendar months after the commission of the offence. Except in these cases, it does not appear that the Statutes of Limitation have any application to suits in the Ecclesiastical or Admiralty Courts.

The Statutes of Limitation must in general be pleaded positively by the defendant in any action at law, who wishes to take advantage of them, and it has been held in equity that unless the defendant claims the benefit of the statutes by plea or answer, he cannot insist upon them in bar of the plaintiff's demand. (Mitf., 277.)

STAUNTON, SIR GEORGE LEONARD, the son of Colonel George Staunton, of Cargin in the county of Galway, Ireland, was born at Cargin, April 19, 1737. At the age of sixteen he was sent to Montpellier in the south of France, where he remained some years, and having completed his studies in the college of that city, he took a medical degree.

In 1760 he returned to England, and resided for some time in London, where he contributed some valuable essays to the periodical publications of that day. He then went to the West Indies, where he practised for a short time as a physician. He held at the same time some official situations in the islands, and having acquired a competent fortune, which he invested in estates in the island of Granada, he returned to England in 1770. He very shortly afterwards returned to Granada, where, having devoted himself to the law, he was appointed attorney-general of the island. In 1774 Lord Macartney went out to Granada as governor, and a warm intimacy and friendship was formed between that nobleman and Mr. Staunton, which ended only with their lives.

Upon the capture of the island by the French, in 1779, Lord Macartney and Mr. Staunton were sent to France as prisoners of war. Lord Macartney proceeded to England on his parole, but Mr. Staunton remained at Paris, and had the address and good fortune to obtain his lordship's exchange, as well as his own. Lord Macartney was thus enabled to avail himself of the appointment which had been conferred upon him, of the government of Madras, and Mr. Staunton, who had lost the whole of his West Indian property, and now had to begin the world anew, accompanied him to India as his confidential secretary.

While in India Mr. Staunton was engaged in a series of missions of great importance. On a very critical occasion, he undertook the delicate office of executing an order of the government, placing under arrest the commander-in-chief of the army, Major-General Stuart. But the transaction in which his diplomatic abilities were chiefly displayed was the negociation of a treaty of peace with Tippoo Sultan in 1784. For this service he was raised to a baronetcy, and the East India Company conferred on him a pension of 500*l.* a year for life. On his return to England he also received the degree of Honorary Doctor of Laws from the University of Oxford.

Sir George Staunton remained at home unemployed from this time until 1792, when he accompanied Lord Macartney in his mission to Pekin, and he had separate credentials as minister plenipotentiary. Sir George's health fell a sacrifice to his exertions upon this occasion. A few months after his return to England he was seized with an attack of paralysis, from which he never entirely recovered. He died in London, Jan. 4, 1801, and was buried in Westminster Abbey. He published a narrative of the proceedings of the Chinese embassy.

STAUNTONIA, a genus of plants of the natural family of *Menispermaceæ* and tribe *Lardizabaleæ*, named in compliment to Sir George Staunton, who introduced many plants from China on his return from the mission with Lord Macartney. This genus is remarkable as being one of those which are common to China and the Himalayan Mountains, and has hence afforded inferences respecting the districts where the tea-plant might be successfully cultivated.

STAVEREN. [Friesland.]

STAVESACRE. [Delphinium.]

STAVROPOL. [Simbirsk.]

STE. MARIE, an island occupied by the French and situated in 16° 45′ S. lat., 50° 55′ E. long., lies off the east coast of Madagascar, from which it is separated by a channel varying from 3 to 10 miles in width. Sainte Marie extends in length from S.W. to N.E. about 30 miles, with a breadth of 5 to 8 miles. A narrow arm of the sea, not far from its most southern extremity, separates a small part of the island at high water from the remainder. The southern part of Sainte Marie is surrounded by a reef, rising above the level of the sea, but there are several openings in it, three of which are deep enough for large vessels. The shores of the island are in general low and swampy, except in a few places of small extent, where they are of moderate elevation. The interior consists of low hills arranged in chains in the direction of the island. The soil is bad, except a narrow tract in the interior, which may cover one-fifth of the area of the island, and which is regularly cultivated by the natives. The channel which divides Sainte Marie from Madagascar is a vast roadstead, with good anchorage, and safe, even during the western gales, which rarely occur. From this channel an inlet, more than 2200 fathoms long, and about 1100 fathoms wide, enters eastwards into the island, and constitutes the harbour of Port-Louis. At the entrance of the harbour is a small island, called L'Ilot Madame, which is fortified. The passage south of this island can only be navigated by small vessels, but the northern passage is deep enough for frigates. The island is watered by many streams, and the water is generally good. The climate is very moist. The wet season begins in March and continues to August. The number of days on which rain falls is stated to vary between 220 and 240. The natives, who live chiefly in villages in the interior, rear cattle and grow rice, mandioc, and some other vegetables; a great part of the island however is covered with forests, which contain many timber-trees. The French settlers grow coffee, cloves, sugar, and vegetables. A considerable number of the natives live on the produce of their fisheries. Dried fish is exported to several places in Madagascar. The population is about 5000, of whom about 4000 are Malgashes, or natives of Madagascar.

STEAM is the name given in general to the vapours arising from moist or liquid bodies when subjected to the action of heat: in the mechanical applications however water is the liquid used; we shall therefore in this article treat steam as the vapour of water.

As the application of heat has generally an expansive effect on bodies, so water converted into steam occupies more than 1700 times its former space. The action of heat in liquefying ice, on the contrary, slightly diminishes its bulk, which remarkable exception to the general effects of caloric is explained by an alteration of the relative positions of the solid elementary crystals of ice in passing into its liquid form.

When ice or snow is in the process of liquefaction, a mercurial thermometer plunged in it will remain constantly at the same height, whatever heat is applied, until the whole mass is dissolved. This heat, latent to the thermometer but measurable by a calorimeter, is the caloric of liquefaction. Continuing after this stage to apply more heat, the thermometer in the water will be observed to indicate rising temperatures proportional to the surplus of heat thus given. Then globules of vapour rise from the bottom of the vessel, and these condensing in the upper part of the water give rise to the series of sounds commonly called *singing*; and when, at length, the globules acquire sufficient elasticity to pass into the air in the form of steam, the water is said to boil. The further application of heat converts gradually the whole of the water into steam, during which the thermometer again becomes stationary, showing the absorption of latent heat; but after this stage has been completed, it proceeds again to indicate degrees of temperature nearly proportional to the surplus heat then applied.

Steam will be produced at a proportionally lower temperature if we diminish the pressure of the atmosphere on the water, which may be done either by ascending a mountain or by drawing away a portion of the air by means of an air-pump. When we continue to apply heat to ordinary steam, under a constant bulk, its elasticity rapidly increases, and it is then termed *high-pressure*; steam of the ordinary temperature being termed *low-pressure*.

The following table gives the temperature of boiling water and the corresponding pressures of the air as observed by Dr. Dalton and Sir J. Robison: those of the former are marked by the letter D, those of the latter by R:—

	Heat of boiling water.	Corresponding pressure of air.
R . . .	215°	31.8
R . . .	212	30.
R . . .	209	28.2
D . . .	200	22.8
D . . .	180	15.2
D . . .	160	9.45

D . . .	120 .	3.27
D	100 .	1.97
D	10 .	1.03

Upon the important subject of the relations between the temperature and elasticity of steam, a multitude of experiments have been made by Watt, Southern, Ure, Dalton, Arago, &c. The following table for high-pressures is from the observations of Southern :—

Atmospheres.	Barometer.	Temperatures.
1 .	29.8 .	212°
2 .	59.6 .	250.3
4 .	119.2 .	293.4
8 .	238.4 .	343.6

The following is a table abridged from Dr. Ure's, showing the elastic force of the vapour of water in mercurial inches, with the corresponding temperatures, in which, it may observed, that Dr. Dalton is confirmed in giving some elastic force even at the temperature of freezing :—

Temp.	Elasticity.	Temp.	Elasticity.
32° .	0.20	200° .	23.60
55 .	0.42	212 .	30.00
65 .	0.63	220 .	35.54
75 .	0.86	240 .	51.70
80 .	1.01	250 .	61.90
90 .	1.36	260 .	72.30
100 .	1.86	280 .	101.90
120 .	3.30	290 .	120.15
140° .	5.77	300 .	139.70
160 .	9.60	305 .	150.56
180 .	15.16	310 .	161.30

Various tables of the same kind have been constructed and published by the French academicians at the request of government, and also by a committee of American gentlemen, which however do not harmonise with the first-named tables.

It has recently been observed that the discharge of steam from boilers is accompanied by a development of electricity. The facts are at present too little methodised to be introduced here.

STEAM-CARRIAGE. The application of the steam-engine to the purpose of locomotion upon railways, has been noticed elsewhere. [RAILWAY.] It only remains to treat of such locomotive machines, impelled by steam-power, as have been contrived for use upon common roads.

In a steam-carriage for use upon a common road, provision must be made for passing over rough, soft, and constantly-varying surfaces, and for surmounting acclivities of considerable steepness; the machine must be provided with a steering apparatus, by which it may be guided with ease and certainty along the sinuosities of a common road or street, among other vehicles, and round sharp corners; the weight must be kept within the smallest possible limits; and the machinery must be compacted within a small space.

The earliest steam-carriage of which we have any account was that of John Theophilus Cugnot, a native of Lorraine, who, about the year 1763, exhibited a model of one to the Comte de Saxe. Dr. Robison and Mr. Watt both about the same time suggested similar machines. Mr. Murdoch, a Cornish engineer, was perhaps the first who actually constructed a steam-carriage in this country. His machine, which is by some writers styled a model, was exhibited at Redruth towards the close of the century. Mr. Symington constructed a model of a steam-carriage, which was exhibited in Edinburgh about 1786.

The next invention which claims notice is that patented in 1802 by Messrs. Trevithick and Vivian, and shortly afterwards brought into operation. Their carriage was mounted upon four wheels; the principal weight resting upon the hind wheels, which were of large diameter, while the fore wheels, which were used for guiding the carriage were small, and nearer together than the others. The boiler and the steam-cylinder were placed at the back of the hind axle, and the cylinder was horizontal. The carriage, shortly after the date of this patent, was exhibited in London with sufficient success to prove the practicability of the invention. The inventors however soon gave up their experiments on common-road locomotion, and adapted their machinery to use upon a railway.

For about twenty years after the experiments of Trevithick, no steam-carriages for common roads were constructed; but when the improved state of the turnpike-roads rendered steam-locomotion more practicable upon them, steam-carriage projectors arose in rapid succession. Mr. Griffith's steam-carriage, patented in 1821, had the boiler and machinery suspended from the frame-work by chains and helical springs. Mr. David Gordon's machine, patented in 1822, had its wheels surrounded by cogs or projecting teeth. This engine was to be placed within a large rolling drum, about nine feet in diameter and five feet wide, the inside of which should be fitted with circular rack-rails, fitting the wheels of the steam-engine. Thus the motion of the engine would cause the drum to roll forward, on the same principle that a squirrel causes a cylindrical cage to revolve; and the rolling of the drum was to move a carriage connected with it. Another machine, by the same inventor, had two long propellers or legs, intended to obviate the supposed tendency of wheels to slip, when ascending a slope. Of others who have invented and built steam-carriages between 1824 and the present time, the names of Goldsworthy Gurney, Burstall and Hill, W. H. James, Walter Hancock, Summers and Ogle, Messrs. Heaton, Dr. Church, Dance and Field, Squire and Macerone, Scott Russell, Hills, and Sir James Anderson, are the most prominent, although many others have appeared upon the field. Several of these inventors have produced carriages capable of maintaining an average speed of from ten to twelve miles per hour for considerable distances, and a much more rapid rate of motion for a short time; and some have succeeded in performing extensive journeys with their steam-carriages. The greatest amount of success yet attained was in a steam-carriage constructed by Mr. Gurney, and brought forward by Mr. Charles Dance, who established a regular steam-conveyance between Gloucester and Cheltenham, a distance of about nine miles. The steam-carriage commenced plying on the 21st of February, 1831, and continued running four times a day for four months, with tolerable regularity; the time of each

averaging about fifty-five minutes. At the end of this time, the project received such determined opposition from coach proprietors and turnpike-trusts, that it was unwillingly withdrawn.

Mr. Gurney spent 36,000*l.* in his enterprise, without any permanent beneficial result. Mr. Hancock commenced running a steam-coach about the same time, on the road from London to Stratford. He afterwards built other steam-carriages; and he repeatedly run one or more as public conveyances about London for several weeks together, with such success as to leave very little reason to doubt the profitable introduction of such vehicles if the opposing interests could be overcome.

The forms of apparatus in these carriages are of course various. As to the boiler, the essential requisites are the power of generating steam very rapidly; strength, to secure it from explosion; lightness; and compactness. A great number of contrivances have been tried with the hope of accomplishing the desired union of these qualities; all of them consisting either of small tubes, or of separate chambers.

The means adopted for producing a strong draft in the fire are of two kinds. Gurney, in one of his carriages, turned the waste steam into a chest or case, acting like the air chamber of a fire-engine, from which it issued into the chimney in a uniform stream; thereby avoiding the panting noise produced by the separate puffs of steam. The other kind of blast—that produced by blowing air into the fire with fanners—was also used by Gurney, and a similar apparatus was adopted by Hancock, Macerone, and others.

Many different arrangements have been adopted for communicating the power of the pistons to the wheels of the carriage; as indeed is also the case in respect to railway locomotives. The contrivances for locking the wheels to the axle need not differ materially from those used for similar purposes in other machinery. In the means of adapting the power of the vehicle to the varying resistance of an undulating road, most steam-carriages have been deficient. This object may be effected to some extent by varying the pressure of the steam; but, if carried too far, this method is dangerous. The use of wheels of different sizes,—small wheels for a slow speed with great power, and large wheels for quick running, when the roads are in a good state, —is an expedient too inconvenient for general adoption.

The operation of steering is usually performed by a hand-wheel in the fore-part of the carriage, giving motion, by means of a rack and pinion, or a chain and pulley, to the fore-axle. The *Brake*, by which the motion of the steam-carriage may be arrested when necessary, usually consists of metallic bands, capable of being pressed against either the nave or the periphery of one or both of the hind-wheels.

STEAM-ENGINE. A steam-engine may be defined generally, as an engine by which the force arising from the properties of elasticity and of instantaneous condensation possessed by steam are transmitted to produce a continuous rotatory motion, either of a fly-wheel to constitute a reservoir of power for the purposes of driving machinery, or

for any other uses to which that power may be applied.

Admitting this definition, the earlier steam-engines, even Captain Savery's, which was long employed in this country, were only pumps for raising water. A partial vacuum was formed in close vessels by the condensation of steam within them, and the atmospheric pressure raised the water to a certain height, whence it was forced higher by the elasticity of the steam admitted to act on its surface.

The first steam-engine which formed the connecting link between the steam-pumps and the modern steam-engines, was invented by Newcomen (1705). It contained a cylinder open at the upper end, fitted with a piston, and rendered air-tight by having water on it to the depth of several inches: the piston-rod was suspended by a chain from the arched end of a beam turning on an axle, and having a pump-rod at its other extremity, loaded so as to counterpoise the weight of the piston, and to raise it to the top of the cylinder. This cylinder was placed over a boiler, with which it communicated by a steam-pipe, furnished with a cock to open or close the passage. There was a cistern fixed above the cylinder, to the bottom of which a pipe passed, also provided with a cock. When the piston was depressed to the bottom of the cylinder, it drove out all the air before it, which escaped at the orifice of a pipe into the water of a smaller cistern. The cock being next opened, the steam from the boiler filled the cylinder, and the piston rose again from the action of the counterpoise. As soon as it arrived at the top, the cock was closed and another cock opened; a jet of cold water from the cistern rushed into the cylinder, condensing the steam, and thus forming a partial vacuum beneath the piston; the pressure of the air on its upper surface forced it downwards, and caused the pump at the other end of the beam to raise an equivalent weight of water to a height equal to that through which the piston moved. The injected water and condensed steam-water then flowed off into the cistern as the air had previously done. When this engine was first introduced, it was the duty of an attendant to open and shut the cocks alternately; but subsequently lever handles to open and shut the cocks were acted on by pins or cams, carried by a rod suspended from the beam; and the engine became self-acting.

Newcomen's engine was successively improved upon by Smeaton, Brindley, and other engineers, previous to Watt's time, and from its intrinsic merits it remained in general use under the appropriate name of the Atmospheric Engine during the greater part of the last century, but was only used for pumping water. Its guiding principle was, that the steam was solely employed to produce a partial vacuum by its condensation, its elastic force at high temperatures not being made use of.

The first and most important of Watt's improvements on the engine consisted in effecting the condensation in a separate vessel, termed the *Condenser*, which communicated with the cylinder. This condenser being filled with steam from the

boiler at the same time with the cylinder, the jet of cold water, admitted into the former only, effected the condensation of the whole volume of steam, both of that in the cylinder as well as of that in the condenser. To effect still further the object of this separate condensation, Watt placed his condenser in a cistern, the temperature of which was kept constant by a fresh supply of cold water, brought from a well by a pump. To maintain the temperature of the cylinder as high as possible, Watt at first cased it in wood to retard the radiation, and subsequently surrounded it by a second iron cylinder, admitting steam from the boiler between the two.

The second of Watt's improvements on Newcomen's engine consisted in closing the cylinder at top, the piston-rod being made to pass steam-tight through a cylindrical neck in that top, termed a *Stuffing-Box*. The object of this alteration was to admit of the elastic force of the steam being employed to impel the piston downwards, instead of simple atmospheric pressure. For this purpose the steam was admitted from the boiler above the piston at the same moment the condensation took place in the condenser; the steam-passage being made double for the purpose, so that the communication with the condenser could be cut off when that with the cylinder was opened, alternately. When the piston had descended to the bottom of the cylinder, the counterpoise at the pump-rod raised it again, as in Newcomen's engine; but to allow of this upward motion, it was necessary to remove the steam which was above the piston, and this was done by allowing it to pass under the piston, and into the condenser through a passage opened at the proper instant for this purpose. Such is the general principle of Mr. Watt's *Single-Acting Engine*, which hence became a Steam-Engine, and was no longer an Atmospheric Engine. It became a *Double-Acting Engine* by removing the counterpoise, and producing the upward motion of the piston by admitting steam below as well as above it.

The changes in the engine introduced by Watt created the necessity for two pumps, and commonly three, which are worked by rods attached to the beam. The first of these is the *Hot-Water* or *Air-Pump*, intended to remove the air, condensed water, and steam from the condenser, in which they would otherwise accumulate, and finally stop the action; the second is a *Force-Pump*, required to return the water, drawn from the condenser by the first, back to the boiler; and the third, termed the *Cold-Water Pump*, supplies the cold-water cistern which contains the condenser.

In the mechanism of a steam-engine, the *Piston* is one of the most important parts, as it must be steam-tight, and yet work easily in the cylinder. The better class of engines have now usually what are called *Metallic Pistons*, of which there are different kinds, invented by Cartwright, Jessop, Barton, and others. The body of these pistons is metal, made in pieces or segments, acted on by springs radiating from a centre; so that while the friction is diminished by both surfaces, being metallic, the piston, owing to its construction, can adapt itself to the irregularities of the cylinder.

In Newcomen's engine the steam was admitted to the cylinder, and the communication again cut off, by means of a cock of the common construction; but a more efficient contrivance is requisite when the steam is to be admitted alternately both above and below the piston, and to the condenser, as it is in engines since the introduction of Watt's improvements. This can be accomplished by a *Four-Passage Cock*, originally invented by Leupold in 1720, and since improved by Bramah and others. Watt employed flat conical valves for the purpose under consideration, which were raised or depressed by cranks acting on a guide-rod at right-angles to the plane of the valve; sometimes his valves were raised by a rack-and-tooth apparatus. In most engines of the present day however the *Slide-Valve*, as it is termed, has superseded the use of the others: a perfectly flat surface slides on another, terminating the orifices which are to be opened and shut.

For the opening and shutting of the valves, an *Excentric* is now generally used. This usually consists of a circular plate of metal, keyed excentrically on the shaft of the fly-wheel, and working within a ring attached to the end of a frame intended to move a crank directly connected with the slide-rod at its other extremity. As the shaft revolves, the excentric plate imparts an alternating motion to the frame, which, being transmitted by the crank, alternately raises and depresses the slide-rod.

The Beam already alluded to in describing the Atmospheric Engine was obviously the readiest mode of connecting the alternating motion of the piston with the pump to be worked; and such beams were usually made of strong timbers. But when the art of making heavy iron-castings was perfected, that metal was substituted for wood, to the manifest improvement of the engine in every respect. Watt also removed the cumbrous arched heads, which had been previously employed for the purpose of causing the piston-rod to move up and down in the same right line; and substituted the beautiful principle of the *parallel motion*, consisting of a system of simple rods or levers, so combined that one point may move in a straight line nearly.

When the engine is employed to drive machinery of any kind, a *Fly-Wheel* becomes a necessary adjunct to it. A fly-wheel is one in which the principal quantity of the matter is distributed in the periphery. When such a wheel revolves on an axis perpendicular to its plane, the greatest quantity of matter moving with a maximum velocity, the momentum of the whole is a maximum; while its inertia, if it be large, causes it to control or equalize the motion of the machinery through which it receives its own. The fly-wheel is connected with the beam by a crank, which converts the alternating circular motion of the crank into a continuous one of the fly-wheel.

When Watt substituted the elastic force of steam for the pressure of the atmosphere, he introduced a source of power which might be increased to an indefinite extent, provided it were found advantageous to employ it. Generally it is more advantageous to employ steam of a compara-

tively high elastic force; accordingly the pressure was increased, in engines constructed by Watt, from 4 to 8 or even 12 lbs. on the inch. Modern boilers are so skilfully made, that steam of 100 lbs. on the inch may frequently be safely used.

Watt originally proposed, though he did not adopt, the employment of the very important expansive power of steam in addition to the action due to the vacuum; but modern machinery admits of the adoption of the method. In the common engine, if the pressure on the piston continue uniform during the stroke, as it would do if the communication with the boiler remained open, the piston would move with an accelerating velocity till it arrived at the end of the cylinder, by which it would produce mischief; hence the steam is cut off at a particular stage in the descent; and when the steam possesses considerable elastic force, the communication with the boiler is cut off sooner, and the piston is urged forward by the expansive force of the steam, which, although decreasing as the space increases, is yet sufficient to carry the piston to the end of the stroke.

The working of an engine may be considered under three conditions. First, when it is working with a given pressure of steam, and with any load or velocity. Secondly, when it is working with a given pressure, and with that load or velocity compatible with the production of a maximum of useful or net force with that pressure; this may be termed the *relative maximum of useful effect.* Thirdly, when the pressure having been determined to furnish the force most consonant with the action of steam in any specific engine, the load is regulated so as to be that most advantageous for that pressure; this last constitutes the *absolute maximum of useful effect* for that machine.

The three fundamental problems for solution in the calculation of steam-engines consist in determining the velocity, the load, and the rate of evaporation in the boiler; since the useful effect, or net available power, is a function of these three quantities; and this net available power may be expressed in six different ways:—1st, by the number of pounds raised to a unit of height in a unit of time; 2nd, by what is termed the 'horse-power' of the engine; 3rd, by the weight raised by the consumption of 1 lb. of fuel; 4th, by the weight raised by the evaporation of a cubic foot of water; 5th, by the number of pounds of fuel, or of cubic feet of water, for each horse-power; and 6th, by the number of horses-power which is furnished by each pound of fuel, or by each foot of water. For the various formulæ by which all these problems may be numerically solved for different kinds of engines, and for the investigations by which those formulæ are deduced, we must refer to more comprehensive works.

In 1781 an engineer named Hornblower proposed using the expansive principle by means of a double cylinder, but was prevented from carrying out his plan by the comprehensive and jealously-guarded patents of Watt and his partners. In 1804 however Woolf brought this principle of the double-cylinder engine into use. In his engine, the steam enters through a passage above the piston in the smaller cylinder at a considerable

pressure. While the piston is descending under its influence, the steam from beneath passes through a tube to the large cylinder above the piston, which is impelled downwards by its expansion, the steam which was previously under this piston having passed to the condenser by another passage. When the stroke is completed, the slide is moved downwards by its rod. But though possessing considerable advantages, the double-cylinder engine has not become common, probably owing to the complication of its structure.

Although the Condensing Engine is very perfect and economises fuel, it is necessarily heavy, and occupies considerable room. For cases where the two last-named particulars are of importance, the *Non-Condensing Engine* was invented. It was first suggested by Leupold, then patented but not used by Watt, and efficiently carried out by Trevithick and Vivian in 1804; their object being to produce a locomotive engine to draw waggons on a tram-road. A locomotive for railways is the most important form of non-condensing engine; but such engines are frequently valuable for other purposes. Since the pumps of the condensing engine are dispensed with in the non-condensing engine, the beam may be so likewise; the piston-rod is made to move in a straight line, by having a cross-piece attached at its top, which slides between guides fixed on each side of the cylinder, the rod which works the crank of the fly-wheel being attached to the end of this cross-piece. A still further simplification is effected by connecting the piston-rod directly with the crank on the shaft of the fly-wheel, the cylinder being mounted so as to oscillate as the wheel revolves on the passage of the steam, and thus alternately to open and close the communication between the top and bottom of the cylinder. Such engines are termed *Vibratory Engines*, and are successfully used where space must be economised, as with marine engines. Non-Condensing Engines are frequently termed *High-Pressure Engines*, in contradistinction to *Low-Pressure* or Condensing Engines.

Marine Engines, or those used for propelling vessels, are in this country generally condensing engines, their situation admitting the abundant use of cold water. The principal peculiarity in the arrangement of the marine engine is the position of the beam, which, for the purpose of economising room, is placed lower than the cylinder, and is double, there being one on each side. In all vessels of any magnitude, there are two engines complete, so arranged that while the rod and crank of one are in their neutral position, those of the other are in that of greatest effect.

Engineers have always been induced, by the obvious advantage of a continuous over an alternating motion, to aim at contriving a steam-engine in which the steam should act directly to produce such a motion. It does indeed appear at first sight that, where the object of the engine is to produce a continuous circular motion of a fly-wheel, or of wheels of some kind, it would be desirable that the steam should be applied directly to impel the wheel, instead of having its force transmitted through a series of levers, necessarily increasing the friction and the cost of the engine. Watt

accordingly patented more than one of such *Rotatory Engines*, and many others since have from time to time brought forward arrangements for the purpose; but none have come into permanent and general use. The fact is, that the employment of steam in this way is productive of a greater waste of power, with a greater increase of friction, than can be compensated by any real advantages.

The peculiarities of the *Locomotive Engine* are noticed under RAILWAY.

No part of a steam-engine exhibits more variety, according to the purpose to which it is to be applied, than the *Boiler*. Rapid generation of steam, security, compactness, and lightness, must be aimed at in boilers for marine or locomotive engines, even at the cost of a comparative waste of fuel; while for those intended for pumping or driving machinery, economy of fuel must be the paramount object, the weight, form, and space occupied by the boiler being secondary considerations. The form of boiler which was used for Savery's, Newcomen's, and other engines down to the time of Watt, was that of an inverted frustum of a cone, with a spherical top, and its bottom slightly concave. Watt adopted a long rectangular form, with a semi-cylindrical top; the ends were flat and upright, and the sides slightly curved inwards, as was also the bottom. The next important modification in form was that of making the boiler entirely cylindrical with hemispherical ends, which is probably the best to combine as many requisites as possible. When an engine is of such a size as to require more steam than one boiler of the ordinary magnitude can supply, it has two or more, set side by side, communicating with a common steam-pipe. Since the extent of surface exposed to the pressure of the steam, and therefore the liability to bursting, increases in a greater ratio than the capacity, there is obviously a limit to size, which can never safely be surpassed, while the security is proportionally increased by diminishing that capacity: hence the necessity for using two or more small boilers instead of one large one; and the principle, carried to its limit, constitutes that of the *Tubular Boiler*, in which the steam is generated in a series of independent metal-pipes of small diameter, all communicating with a common steam-chamber or reservoir, itself small, and strong enough to resist great pressures.

Since, in accordance with the general hydrostatic law, every unit surface of the boiler has to sustain the same pressure, if a small portion of that surface can be opened by the pressure of the steam, when it has attained that which the boiler was only intended to withstand, by the escape of a quantity of the vapour at this orifice, the elasticity of the remainder is again reduced below the limit. This is the object of the *Safety-Valve*, which is such an aperture, kept closed by a valve retained in its seat by a weight calculated to yield to, or be raised by, the pressure the moment the steam exceeds its proper elastic force. The forms of safety-valve are various.

To indicate the actual pressure at any time of the steam within the boiler, this is furnished with a *Gauge*, consisting of a bent tube, open at both ends, one orifice opening into the boiler. This tube contains mercury, which will obviously be at the same level in both branches when the steam in the boiler is of the same pressure as the atmosphere, but will rise in the longer leg as the pressure of the steam increases, and will thus by its altitude indicate that pressure. If the longer leg be of a certain length, the mercury would flow over, or be blown out altogether, if the steam were suddenly to increase in its elastic force, and the gauge would in this case act as a safety-valve. Water-Gauges are sometimes employed. There are also Gauge-Cocks to indicate the height of the water in the boiler. The hot water which collects in the condenser, from the condensation of the used steam, is pumped up again into the boiler, to avoid the loss of the heat which it contains.

Whenever the steam-engine is employed to execute any work which is variable in its quantity or intensity, there must be some means of adjusting the force of the engine to this varying resistance it has to overcome. The object of that beautiful piece of mechanism termed the *Governor* is to enable the engine to regulate the supply of steam admitted to the cylinder, or in other words to adapt the force it has to transmit to the resistance it has to overcome. In this apparatus, two balls rotate round a common axis, with a velocity depending on that of the fly-wheel; if this velocity is great, the balls diverge by virtue of the centrifugal force, and this divergence is a means of partially closing a valve, and lessening the amount of steam which enters the cylinder. In the Marine Engine no governor is requisite; the resistance being so great compared to the force, that the velocity can never be excessive, and all the power the engine is capable of exerting is required to turn the paddle-wheels. The governor is equally unnecessary to the Locomotive Engine, since the attendant must constantly have the engine under his control, and be watching its action; and he can therefore regulate the throttle-valve by hand-gear placed within his reach.

STEAM-VESSEL, a vessel moved by the power of a steam-engine acting upon paddle-wheels or other mechanism for propelling it through the water.

Closely connected with the application of the steam-engine to the purpose of propelling vessels, is the use of revolving paddles or similar contrivances in lieu of oars. Wheel-boats, impelled either by oxen, horses, or men, were known to the Romans.

Papin proposed a kind of steam-boat, but made no attempt to construct one; and after his time several plans for propelling boats by other means than oars or sails were proposed and tried. At length, in 1774, the Comte d'Auxiron, a French nobleman of scientific attainments, constructed a steam-boat, and tried it on the Seine, near Paris. It appears that the engine had not sufficient power to move the wheels efficiently; an error which was also observable in contrivances brought forward shortly afterwards by Perier and others. The Marquis de Jouffroy tried a steam-boat of considerable dimensions on the Saône, in 1782: it had a single paddle-wheel on each side, and the

machinery appears to have been constructed with some skill, though it was not sufficiently strong. *M. des Blancs* in 1796 formed a boat which was propelled by means of paddles or float-boards attached to an endless chain stretched over two wheels projecting from each side of the vessel.

In America an inventor named Fitch succeeded as early as 1783 in moving a boat on the Delaware by means of paddles (not paddle-wheels) set in motion by a steam-engine. In 1787 Rumsey made some short voyages on the Potomac, with a boat about fifty feet long, propelled by the reaction of a stream of water drawn in at the bow and forced out at the stern by means of a pump worked by a steam-engine. This boat moved, it is said, at the rate of three or four miles an hour, when loaded with three tons, in addition to the weight of her engine, which was about one-third of a ton. Neither Fitch nor Rumsey succeeded in giving commercial importance to their inventions.

While Fitch and Rumsey were making their experiments in America, other experiments were in progress in Scotland, which tended, more than any previous trials, to the useful application of steam to the purpose of propelling vessels. Mr. Miller, of Dalswinton, Mr. James Taylor, and Mr. Symington, were the three persons who had most to do with this important improvement. All three were engaged on inventions relating more or less to the subject; and in 1788 a steam-boat was constructed, to which the ingenuity of all three was applied. A small steam-engine was placed in a small double pleasure-boat belonging to Mr. Miller, and was tried upon Dalswinton Lake. The engine was placed on one side, the boiler on the other, and the paddle-wheel in the middle. With all the disadvantages of a first experiment, and with cylinders of only four inches diameter, the boat moved with the velocity of five miles an hour. In 1789 an engine of about twelve-horse power (or twelve times the power of the first) was made by the same parties at the Carron works, and was mounted in a large double-boat, with which a speed of seven miles an hour was attained. From various causes none of the three inventors concerned in the project pursued the subject farther till the year 1801, when Symington commenced a satisfactory series of experiments on steam navigation, under the auspices of Lord Dundas. The object immediately aimed at was the introduction of tug-boats instead of horses for drawing boats upon canals. After several minor trials, one of the boats built on this occasion by Symington drew, on the Forth and Clyde Canal, in 1802, two loaded vessels, each of seventy tons burden. On this occasion, it travelled with its load a distance of nineteen miles and a half in six hours, although there was so strong a wind ahead that no other vessels in the canal could move to windward on that day.

While the experiments of Symington did not lead to the immediate adoption of steam-vessels for commercial purposes, they probably tended, in no unimportant degree, to their subsequent profitable establishment in America and in Great Britain; for among the numerous individuals who inspected his vessel with interest were Fulton and

Bell. After various minor attempts, Fulton placed upon the Seine, near Paris, a steam-boat, which would have possessed considerable power had the engine been larger. Fulton availed himself of many of Symington's improvements, and procured, in conjunction with Mr. Livingstone, a patent in America for steam navigation, about the year 1805.

Fulton returned to America towards the latter end of 1806, and immediately commenced building a steam-boat for use upon the Hudson. This vessel was built at New York, and was launched in the spring of 1807. It made its first voyage from New York to Albany, 145 miles, at the rate of five miles an hour. The dimensions of the boat, which was of 160 tons burden, were 133 feet long, 18 feet wide, and 7 feet deep. Her cylinder was two feet in diameter, and of four feet stroke; and the paddle-wheels were fifteen feet in diameter, with paddles four feet long, dipping two feet into the water. The vessel made several trips as a passage-boat between New York and Albany in the year in which she was launched; and after being repaired and strengthened during the winter, she was again brought into action in 1808, with complete success; a river steam-navigation became firmly established in America. Meanwhile Mr. Stevens, of Hoboken, near New York, introduced steam-boats on the Delaware, and made such improvements in the form of the vessels as to enable him to obtain a speed of thirteen miles an hour. He also adopted a different form of engine from that of Fulton; using cylinders of very long stroke with upright guides, instead of the old parallel motion, and placing the working-beam above the deck.

The practical application of steam navigation in Scotland, though attributable to the experiments of Miller, Taylor, and Symington, at least as distinctly as were the operations of Fulton upon the rivers of North America, did not take place till a few years later, and was in some degree suggested by them. Henry Bell, of Helensburgh, on the Clyde, the individual by whom steam-vessels were first used in Britain for commercial purposes, had been well acquainted with the experiments at Dalswinton and on the Forth and Clyde Canal; but he did not take any step for carrying into effect the important scheme of which they proved the practicability, until the proceedings of Fulton, combined with peculiar circumstances in his own case, urged him to do so. He built a small steam-vessel called the Comet, of forty feet keel and ten a half feet beam; and of about twenty-five tons burden, and three-horse power. The boiler was placed on one side of the vessel, and the funnel or chimney, was bent so as to rise in the centre of the vessel, where it served the purpose of a mast for carrying sail. A single cylinder was used impelling a cranked axle which carried a large toothed wheel; and this wheel, working into two others fixed upon the axles of the paddles, caused them to revolve. Two paddle-wheels, or rather two sets of revolving paddles, each consisting of four paddles of a form resembling malt-shovels, were used on each side of the vessel. The Comet began to run regularly between Glasgow and

Helensburgh, in January, 1812, and continued to ply successfully during the following summer; her rate of motion was about five miles an hour. Improvements were soon found adviseable, and Bell soon abandoned the peculiar arrangement of paddles by which his first experiment was distinguished, and adopted complete paddle-wheels. From that time to the present numerous experiments and an uninterrupted succession of improvements have brought steam-navigation to its present high state of perfection.

Form and Mechanism of Steam-Vessels.—As a ship, a steam-vessel should possess the qualities that favour rapid and steady motion through the water, combined with safety and strength to enable it to bear, without injury, the strain of the propelling machinery. Most of what has been effected by way of improvement upon the imperfect models of the first steam-boat builders, in Great Britain as well as in North America, has been the result of repeated trials, stimulated by the generous rivalry of different builders, rather than of any minute investigation of scientific principles. The early steam-boat builders, both in America and in Great Britain, erred in adhering too closely to the form and proportions of sailing-vessels. The proportions of steam-vessels were, originally, like those of sailing-vessels, short and full, their length being only about three or four times their breadth; while now the proportion of six breadths to the length is common in the best sea-going steam-vessels, and many of the fast river-boats are still longer, ranging in length from seven to ten times their width. In America the proportion of length to breadth is sometimes made even greater than as ten to one; and boats have been built, the length of which is twelve times their breadth. In larger steamers, the depth of the hull bears a greater ratio to the width than in smaller vessels.

In the formation of steam-ships, one class of builders adopts a sharp bottom, a great rise of floor, great breadth of beam, extensive bearings on the surface, and round sides and water-lines; thus producing a full capacious stable sea-going ship, merely varied in its proportions to adapt it for steaming. Another adopts a flat bottom, long floor, more angular bilge, upright sides, straight entrance, clean run, and sharp ends; peculiarities which give little stability, but are chosen with a view to passing through the water in all weathers, with little resistance or change of position. A third school adopts the formation of which Russell has established the principles, and of which what he calls the 'hollow wave-lines' are the distinguishing feature. Owing to the necessity of providing a wide and solid base for the engines, in as low a position as possible, it is adviseable to make about two-thirds of the width of the vessel in the middle nearly flat; and it is desirable to make the sides at the same part as nearly vertical as may be, consistently with giving an easy turn to the bilge. Where the sides are made full, spaces are left on each side of the engines, of which no convenient use can be made; and the greater breath of beam consequent on such a form is injurious to the vessel. In vessels constructed upon the wave-line system, the principle followed is, 'that the hollow lines forming the entrance are to correspond, as nearly as may be consistent with the form of a ship, to the form of a certain wave capable of moving with the same velocity as the vessel.'

One of the important questions which has of late years attracted much attention in connection with steam navigation, is that of the comparative advantages of iron and wood as materials for steam-vessels. Small vessels of iron have for many years past been used for river and canal navigation; and recently steam-vessels of considerable size have been built of the same material. Although different opinions prevail as to the relative advantages of the two materials, it is certain that, owing to the superior strength of iron, and its power of bearing strain in any direction, an iron vessel may be made much lighter than one of wood of equal strength; the saving of weight being sometimes estimated at one-half. Another great advantage of iron consists in the facility with which it may be formed into any shape. An iron hull is also superior to one of wood in its security from fire and its greater cleanliness.

Whatever material be adopted, a steam-vessel should be strengthened or stiffened by such a system of trussing as will enable it to bear the weight and strain of the machinery without alteration of form. The river-steamers of North America are remarkable for the skill with which this object is effected, notwithstanding their extremely slight build. In some of these vessels a trussed framing rises to a considerable height above the deck, and distributes the weight and strain of the engine over a great space. Steam-vessels may be greatly strengthened by means of water-tight bulk-heads or transverse partitions in the hull, the adoption of which is becoming very general in large steamers.

The mechanism of steam-engines having been described in a previous article, it only remains here to notice the principal modifications required in order to their convenient application to the propulsion of vessels. As an ample supply of cold water can always be commanded for the purpose of condensation, there is less inducement for the use of high-pressure steam in marine engines than in almost any others; and this circumstance, combined with the prejudice against the safety of high-pressure boilers, has led to the almost universal adoption of low-pressure, or condensing engines, in European steam-vessels; although many of the steamers of North America are worked at a pressure of 140 lbs. to an inch, or even more. In American river-steamers, the beam is formed somewhat like that of land-engines, and nearly all the machinery is above deck; but in American sea-steamers, and in nearly all British steam-vessels, the machinery is either entirely or principally below deck, and consequently a very different arrangement is necessary.

The kind of marine engine most commonly used in this country, is the side-lever engine, where two distinct engines work separate cranks

upon the same axle. Many plans have been contrived for rendering the machinery lighter and more compact, and simplifying the connection between the piston-rods and the cranks. In some small vessels the connection is very simple, the cylinders themselves vibrating on trunnions or gudgeons, so that they adapt themselves to the position of the cranks, and impart the force of their pistons to them without the intervention of a jointed connecting-rod. Another very simple plan is that adopted in some of the government steam-frigates. In these the cylinders are fixed, and the movement of the piston-rods is vertical, but they are surmounted by connecting-rods, pivoted to them, which adapt themselves to the position of the cranks. In another modification of the plan of direct connection, the top of the piston-rod carries a transverse cross-head, from which descend two rods, one on each side of the cylinder. To the lower ends of these side rods are attached the lower ends of two connecting-rods, at the upper ends of which is another cross-head, and from the centre of this cross-head a short rod communicates motion to the crank. This plan has been simplified by Mr. David Napier, by uniting each cross-head with its pair of side-rods into one forked piece of metal. Another arrangement for accomplishing the same object as the preceding is that to which the name of the Steeple-Engine has been given. In this the upper end of the piston-rod carries a frame of iron, which rises considerably higher than the paddle-shaft; the sides of the frame passing up on each side of the shaft, and being so far apart that the crank may turn freely within it. The connecting-rod descends from the upper part of the frame to the crank, and so imparts to it the motion of the frame and piston-rod. Among inventions of this class may be mentioned two novel forms of engine patented by Messrs. Maudslay and Field, with the intention of affording, by the extensive piston-surface, facility for the use of steam expansively. In one of these two cylinders and pistons are placed near together, the movements of the pistons being simultaneous. The two piston-rods carry a cross-head, from the centre of which descends a bar, and to the lower end of this bar the lower end of the connecting-rod is attached. The other plan consists of one very large cylinder and piston, with two piston-rods; the arrangement resembling that of the steeple-engine, but being more compact, because, as the piston-rod is double in every part, the crank may revolve close to the top of the cylinder.

The proportion between the length of the piston's stroke and the diameter of the cylinder is a point upon which much difference of opinion exists; some advocating a very long stroke and comparatively small diameter, and consequently a crank of large radius, while others prefer the more compact arrangement of a small crank and short stroke, and obtain the requisite power by using a piston of large surface. The former system is carried to the extreme in the steam-vessels of North America, some of which have a length of stroke equal to three or four times the diameter of the cylinder; while in this country the length of stroke is generally not much greater than the diameter, and in some cases is even less.

The means adopted for condensing the steam is a matter of great importance in sea-going steamers. The most effectual method of condensation is by the injection of cold water into the condenser, or by causing it to fall in a thin sheet, to which the steam is exposed. By this actual contact with cold water the steam is instantaneously condensed, and consequently the effective action of the engine is ensured; but, as the condensed steam is necessarily mixed with the condensing water, it follows that, during a sea-voyage, the boilers must be fed with salt-water, which, as it evaporates, deposits salt and other sedimentary matter on the interior surfaces of the boiler. The removal of this sediment is a matter of great importance, and has given rise to many contrivances on the part of engineers. The use of copper instead of iron as a material for boilers lessens the evil attending the use of salt-water, as the sedimentary matter does not form a crust upon it, but is precipitated in a loose form, and easily removed; but both materials are liable to other objections, which can only be removed by the use of fresh water in the boilers and condenser, and allowing the salt water to act only on the outside of the condenser. Hall's Condenser and Howard's Vapour-Engine are two methods of attaining this object; but neither of them has fully realised its intended purpose.

In the construction and arrangement of marine boilers, safety, and the power of generating steam with great rapidity, are the grand requisites. The furnaces should be, as much as possible, surrounded with water; and, to economise heat, as well as to avoid the injurious effect of its radiation upon the vessel, the boilers and steam-pipes should be coated with felt, which is applied to the surface by means of a thick covering of white and red lead. The boilers, of which there are three or four in most large vessels, are placed side by side across the vessel, immediately in the rear of the engines, and their flues are usually conducted into one large funnel or chimney.

The framework of the engines should be so contrived as to relieve the vessel as far as possible from strain, by causing the inevitable strain of the machinery to be, as it is termed, self-contained. The general arrangement should also be such as to allow free access to every part, and to bring the valve-gear within convenient reach of the engineer.

Notwithstanding the defects commonly imputed to it, and the great number of contrivances which have been devised for avoiding them, the common *Paddle-Wheel* continues to be the chief means of propulsion used. It consists of a number of flat boards, called float-boards or paddles, bolted to the radii or arms of a light but strong iron wheel, which is fixed securely upon the crank axis of the engine; and it should be so placed that the lowest float-board is entirely immersed in the water. Several improvements upon the common paddle-wheel have been introduced, which tend to diminish the defects attributed to it.

Screw-Propeller.—Besides the mode of propulsion by paddle-wheels, a sort of screw somewhat resembling the Archimedean Screw [SCREW OF

ARCHIMEDES] has been of late years applied to this purpose. The first vessel so fitted was a yacht, in which such a screw was fitted into the dead-wood, between the keel and stern-post. The screw consisted of a helix, making but one revolution around a horizontal axis, passing longitudinally through the ship; and it was put in motion by a steam-engine.

One of the largest Screw-Propellers ever constructed belonged to the Great Britain. This immense vessel, as it left the builder's hands, and before it underwent alterations consequent on its being stranded in Dundrum Bay, was 320 feet long and 50 feet broad in the widest part. The burthen was about 3000 tons, and the engines, consisting of four cylinders of 88 inches diameter and 72 inches stroke, were of 1000 horse power. This great ship was fitted, on her completion in 1845, with a screw-propeller 15½ feet in diameter, with six arms, mounted in the stern, and capable of being turned with great rapidity by means of a chain-wheel of 18 feet diameter, which was immediately connected with the engines, and communicated its motion through an endless chain to a much smaller wheel fixed on the shaft, which constituted the axis of the propeller. The propeller was thus turned with a velocity exceeding that of the crank-axis in a ratio determined by the relative diameters of the larger and smaller chain-wheels. Thus mounted, and furnished with six masts, five of which were stepped on deck so as to be removeable at pleasure, with wire rigging, and with every requisite for taking advantage of favourable winds, the Great Britain sailed from Liverpool on the afternoon of July 26th, 1845, on her first trans-Atlantic voyage, and reached New York on the afternoon of August 10th. After her fourth voyage (the second homeward trip), during which she was left for some time wholly dependant upon her sails, in consequence of the shattering of the propeller, she was fitted with a new and much stronger propeller, weighing seven tons, of the same diameter as before, but consisting of only four arms or vanes; and she was at the same time fresh rigged, her number of masts being reduced to five, and the whole stepped upon the keelson. With these alterations, in an experimental trip made on the 30th of May, 1846, the Great Britain attained a speed of 11⅛ nautical miles, or about 13½ statute miles per hour. Within a few months afterwards, the Great Britain met with her disaster in Dundrum Bay.

The absence of the ponderous paddle-wheels and paddle-boxes of an ordinary steamer greatly improves the sailing qualities of a screw-propelled vessel, while the arrangement of the machinery may be such as to render the vessel far more commodious, and, if desired, to leave the upper decks open from end to end. These, among other advantages, recommend this mode of propulsion for steam-frigates, and other vessels of war; and there are at the present time, both in the royal and the commercial navy, many large and fine screw-propelled steamers.

The usual position of the screw-propeller, immediately before the stern-post, does not appear either to be disadvantageous for the application of the propelling power, or to interfere with the action of the rudder; and some have even contended that the propeller has the effect of increasing the efficiency of the rudder. Under the impression however that a contrary result takes place, it was proposed, in Maudslay's patent of 1843, to put the propeller behind the stern-post, in the position usually occupied by the rudder, and to employ two rudders, placed beneath the stern quarters, a little in advance of the propeller.

An important use to which screw-propellers have already been applied in a few instances, and for which it is highly probable that they may be extensively adopted, is as a mere auxiliary power, for occasional use during calms and contrary winds, to vessels which are ordinarily moved by sails alone, and which are not therefore to be regarded exactly as steam-vessels. One of the first examples of this kind was the American packet-ship Massachusetts, which, though in all other respects a regular sailing vessel, was provided with a small Ericsson propeller, 9½ feet in diameter, and had towards the stern of the vessel a steam-engine which could be set to work when required, of 170 horse-power, capable of producing a speed of about 9 miles per hour in smooth water. The propeller was so constructed as to be raised out of the water when not in use. In sailing from Liverpool to America this vessel, in her voyage performed between October 22 and November 18, 1845, gained from five to thirteen days as compared with five other ships which sailed either on the same or on the following day. The cost of the motive power in this vessel was about two-sevenths of her total cost, which was about 16,000*l*. Auxiliary screws have been furnished to some of the Arctic exploring ships.

Various kinds of life-boats have been invented for steam-vessels, some of which are of such form and dimensions as to serve, when inverted, for the upper part of the paddle-box; and may, when necessary, be immediately turned over and lowered outside the paddle-wheel.

The number of steam-vessels registered at all the ports in the United Kingdom on Jan. 1, 1849, was 1110. Of this number 161 belonged to Scotland, 106 to Ireland, and the rest to England and Wales. Of the whole number, 1044 were built of wood, and 66 of iron. The total tonnage, exclusive of engine-room, was 150,541 tons; the total gross tonnage, inclusive of engine-room, 255,371. The total horse-power was 92,862. Classified as to size, the number of steamers was as follows:—

100 tons and under	529
100 to 250 tons	272
250 to 400 tons	136
400 to 600 tons	71
600 to 1000 tons	67
1000 tons and upwards	35
	1110

STEARIC ACID. This substance is procured from stearin by the action of potash and hydrochloric acid. It has the form of brilliant white scaly crystals; it is inodorous, tasteless, insoluble

in water. It melts at about 158° of Fahrenheit, and on cooling it forms a crystalline mass. It is volatile, and may be distilled unaltered in close vessels. In the air it burns like wax. It consists of $C^{68}H^{66}O^{5}$. In the state of crystals it contains two equivalents of water. Stearic Acid forms compounds with the alkalies, earths, and metallic oxides, which are called *Stearates*. Stearic Acid, besides its use in the manufacture of soap, is now very largely employed in the making of candles.

STEARIN (from στέαρ, *fat*) is the harder portion of animal fats; *Olein*, or *Elain*, being the softer part. Stearin has a pearly lustre, is soft to the touch, but not greasy; it melts at about 140° to 145° Fahrenheit; and, on cooling, solidifies into a mass like wax, which is not crystalline in its texture, and is reducible to powder. Stearin is the chief and most important ingredient of the harder kinds of fat, and the harder they are the more they contain. It is separable into two different principles, namely, *Stearic Acid* and *Glycerin*. It appears to be a bi-stearate of glycerin, consisting of Stearic Acid[2], Glycerin[1], Water[2].

STEARON is a volatile liquid obtained from Stearic Acid, and consisting of $C^{68}H^{66}O^{1}$.

STEAROPTEN is the solid portion of the various volatile oils obtained by distillation from plants, the liquid portion being called *Elaopten*. Camphor is a stereopten.

STEATITE, *Soapstone*. This mineral, which is principally a hydrated silicate of magnesia, is met with massive in amorphous masses, which sometimes contain crystals of this substance of the form of quartz and calcareous spar. It is soft, and has a greasy feel. It has a compact structure, grayish colour, and is translucent at the edges.

STEEL. Iron possesses many qualities which render it applicable to innumerable purposes in the arts; but there are some uses for which it is not sufficiently hard, and this defect is supplied by converting it into steel. Steel is an intimate compound of iron and charcoal or carbon. There is carbon in soft iron, but in steel it appears to be in more intimate union with the metal.

Hitherto Swedish and Russian bar-iron have been exclusively employed in the manufacture of the best steel. The preference given to this iron is decided, though from what cause it arises has not been satisfactorily made out. We may however remark, that the foreign iron used is made from magnetic iron ore with charcoal, while British iron is obtained mostly from the impure carbonate of iron, called argillaceous iron-ore, or from hæmatite, which is a peroxide of iron, and both of these are reduced by employing coal or coke.

Bar-Steel is made, with few exceptions, from the Swedish and Russian iron, the bars of which are marked *Hoop L*, *G L*, and *Double Bullet*, which are the best kinds. Iron of lower quality is also used, both Russian and Swedish, each kind having its peculiar mark. These steel irons are imported almost exclusively by English merchants residing in Hull. The limited quantity of the fine iron allowed to be produced from the mines of Danemora in Sweden accounts in some degree for the high price at which they are sold. The quantity of iron imported into this country for the manufacture of steel is estimated at 12,000 to 15,000 tons, of which at least 9000 come from Sweden.

Manufacture of Steel.—The usual operation is first to cut the bar-iron into certain lengths, leaving room in the vessels for the expansion of the iron, which amounts to $\frac{1}{12}$. The closed vessels in which the bars are heated are usually twelve feet in length, and divided into two pots or troughs, on the bottom of which the workman strews charcoal to the thickness of about an inch, and upon this he places on their flat side a layer of bars; then about three-fourths of an inch more of charcoal is added, and upon this he places another layer of bars, and so on till the troughs are filled; these are then covered with a ferruginous earth coming from the grinding-stones, called wheelswharf, to the thickness of about eight inches. All the apertures of the furnace are then closed with loose bricks and plastered over with fire-clay. The fire is then lighted, and in four days and nights the furnace is at its full heat, at which it is kept for several days, according to the degree of hardness required. In order to be able to test the progress of the carbonization, a hole is left in one of the pots near the centre, and three or four bars are placed in the furnace in such a manner that the ends come through this opening, and after the sixth day one is pulled out. If the iron be then not sufficiently carbonised, the heating is continued from two to four days longer; a bar is drawn every two days, and when the iron is completely converted, the fire is heaped up with small coal, and the furnace is left to burn out, and it requires from this period fourteen days' time to cool sufficiently to allow a person to go in and discharge the steel. A Converting Furnace, as it is called, contains generally fifteen tons of iron; and there are some large enough to hold eighteen to twenty tons. The bar-steel, when discharged from the furnace, is partially covered with small raised portions of the metal; and from the resemblance of these to blisters, the steel is called *Blistered Steel*. The degree of conversion produced depends upon the purpose to which the steel is to be applied.

Bar Steel as it comes from the converting furnace is used for various purposes without refining. Those parts which are free from flaws and blisters are broken out and hammered or rolled to the sizes required by the manufacturer for files, edge-tools, table knives and forks, coach-springs, and a great variety of common agricultural implements. It is also manufactured into what is called *Sheer Steel*, which is more homogeneous, tougher, and capable of receiving a finer edge, than bar steel, which is converted into sheer steel by repeated heating, hammering, and welding.

The fabrication of *Cast Steel* is comparatively a recent invention. It was first made by Mr. Huntsman, at Attercliff, near Sheffield, in 1770, since which time the manufacture of it has very much increased, and it is daily superseding the use of bar and sheer steel, on account of the equality of its temper, and the superior quality as well as beauty of the articles which are made of it. The

process adopted is that of taking bar steel converted to a certain degree of hardness, and breaking it into pieces of about a pound each; a crucible charged with these is placed in a melting-furnace, similar to those which are used by brass-founders. The furnaces are 20 inches long by 16 inches wide, and 3 feet deep. The most intense heat is kept up for two hours and a half or three hours, coke being used as fuel. When the furnace requires feeding, the workman takes the opportunity of lifting the lid of each crucible and judging how long the charge of each will be before it is completely melted. All the crucibles are usually ready about the same time. They are taken out of the furnace, and the liquid steel is poured into ingots of the shape and size required: the crucibles are immediately returned into the furnace; and when the contents of all have been poured into the moulds, the crucibles are again charged. They are used three times, and then rejected as useless. The ingots are taken to the forge-tilt or rolling-mill, and hammered into bars or rolled into sheets, as may be required. The celebrated *Wootz*, or Indian Steel, is cast steel; but it is frequently so imperfect as to resemble cast-iron rather than cast-steel. It is however made of iron obtained, as the Swedish is, from the magnetic ore. Wootz is made by the natives from malleable iron, packed in small bits with wood in crucibles, which are then covered with some green leaves and clay: about two dozen of these crucibles are packed in one furnace; they are covered with fuel, and a blast given for about two hours and a half, which terminates the operation. When the crucibles are cold, they are broken, and small cakes of steel are obtained in the form in which it is brought to England.

Properties of Steel.—Steel is of a lighter gray colour than iron, and which is so characteristic as to be described as a *steel-gray*. It is susceptible of receiving a very high polish, and this is greater as the grain is finer. The density of steel is about 7.8. When steel is heated to redness and slowly cooled, it is scarcely harder than iron; but by very rapid cooling it becomes hard, and so brittle as to be readily broken. The fracture of steel is usually fine grained; in ductility and malleability it is much inferior to iron, but exceeds it greatly in elasticity and sonorousness. It may be subjected to a full red heat, or 2786° Fahr., without melting, and is therefore less fusible than cast-iron, but much more so than wrought-iron. Pieces of steel which have not been cast may be readily welded together or with iron; but after casting the operation is more difficult. Steel does not acquire magnetic polarity so readily as iron, but retains it much longer; by exposure however to a moderate degree of heat this power is lost.

In order to give to steel the different degrees of hardness required for the various purposes to which it is applied, it is subjected to the process of what is called *Tempering*. It is found that the higher the temperature to which it is raised, and the more sudden the cooling, the greater is the hardness produced. The steel is usually immersed into a bath of mercury or of oil, having a temperature varying from 430° to 600°. Captain Kater found that 212°, or the heat of boiling water, was the exact point at which the knife-edges attached to a pendulum were properly tempered.

Case-Hardening is the operation by which articles made of malleable iron or cast-iron are superficially converted into steel by heating them with charcoal in a crucible.

With respect to the composition of steel and the nature of the admixture requisite to constitute it, differences of opinion have long existed, and the question even now is considered by some as hardly decided, whether carbon is indispensably necessary to its formation, and whether certain substances or metals, especially silicon, may not give rise to it. All steel contains a little silicon and phosphorus as well as carbon.

Mr. Faraday and Mr. Stodart published in the 'Phil. Trans.' for 1822 a valuable series of experiments on alloys of steel, from which it appears that by combining steel with other metals its quality is improved. For the details we refer to the memoir, merely stating that a very minute addition was found sufficient to produce a good effect: thus one 500th of silver gave an alloy harder than cast-steel; one 100th of nickel gave a very hard alloy, susceptible of a fine polish: alloys of rhodium and platinum were also formed; and these, with the alloys of iridium, osmium, and palladium, formed the most valuable compounds.

STEEL ENGRAVING. As far as regards facility of execution, whether by etching or by cutting with the graver, probably no material could be found superior to copper, which is still preferred by many engravers, where the fine and free character of the work is more important than the durability of the plate; but the comparative *softness* of copper occasions it to wear so rapidly in the process of printing, that the beauty of the engraving is very soon impaired, and it is impossible to produce, from a single plate, a sufficient number of impressions for the illustration of books of large circulation. The use of steel plates for diminishing this inconvenience, although not extensively resorted to until within the last thirty years, is a measure of which the possibility was conceived at an early period.

The introduction of the modern art of steel engraving appears to be attributable, in a considerable degree, to the excitement which existed on the subject of the forgery of bank-notes. That subject was investigated in 1818 by a committee of the Society for the Encouragement of Arts, Manufactures, and Commerce, who received several proposals for rendering bank-notes more difficult of imitation; and the very interesting communications made to the committee were published by the Society in 1819, as a supplement to their 'Transactions.' Mr. Warren exhibited to the committee a specimen of engraving upon soft steel, which fully proved its practicability; and it was also explained by several witnesses that a block or plate of steel might be softened so as to render it easy to cut, and subsequently hardened to enable it the better to resist wear in printing.

These inquiries led to the introduction of

Messrs. Perkins and Heath's mode of engraving on steel; of which the following is a brief account. The engraving is executed upon a plate or block of cast-steel, which, to prevent the risk of warping, is of considerable thickness. The surfaces of this plate are decarbonised by placing it in a close cast-iron box, with a sufficient quantity of iron-filings to cover the plate to the thickness of at least half an inch, and exposing it, while thus enclosed, to a white heat, until the steel is decarbonised, or converted into very pure soft iron, to a depth equal to about three times the depth of the incisions to be made in executing the intended engraving. The box is then cooled very slowly, being covered up with fine cinders to prevent the access of air. On the plate thus softened the engraving is effected with facility; and, when it is completed, the hardness of the surface is restored by exposing the plate for some hours to a red heat, the surface being thickly covered with animal charcoal, formed of burnt leather or bones, and the whole being, as before, enclosed in a cast-iron box. The plate is afterwards cooled and retempered in a very careful manner. From this hardened plate the engraving is transferred to a softened steel roller, of small diameter, which is pressed against the plate with such force that its surface becomes embossed with a perfect transfer or impression of the engraved device. The roller, or cylinder, is then hardened in a similar manner to the original plate, and is afterwards made to transfer the devices from its surface to any required number of softened or decarbonised plates, which are then hardened for printing from. This beautiful process is not only applicable to transferring engravings from one plate to another; but, in cases where one ornament has to be repeated several times on one plate, the device may, by being once engraved, be impressed as often as necessary upon different parts of the same plate. The power of multiplication is, for all practical purposes, unlimited. It is by such a process that the postage stamps are produced, millions of impressions being produced from only one originally engraved plate. The perfection which has been attained is almost beyond conception; the finest writing, and the most minute and intricate patterns, being transferred from plate to plate with such precision that the keenest scrutiny cannot detect a difference between the original and the transfer. The plan has been much used for country bank-notes and similar purposes, and has been occasionally resorted to for engravings of pictorial character, for which however the kind of steel engraving yet to be noticed is most commonly employed.

The application of steel engraving to works of fine art is, in a great measure, due to the late Mr. Charles Warren. In 1823 that gentleman made a communication upon the subject to the Society of Arts, who voted him their large gold medal for his improvements in the art; a prize which he did not live to receive. In this method, the steel is softened to receive the graver, and is printed from in this softened state. Warren's original mode of decarbonising steel plates was similar to that adopted by Perkins, excepting that the box was filled with a mixture of iron turnings and pounded oyster-shells, instead of simply iron filings, and that several plates were laid in the same box, alternating with layers of the decarbonising mixture. Improved methods have been since introduced. The surface of a steel plate should not be polished very highly, and in applying etching ground to it, the plate should not be heated quite so much as is usual with copper. The ground should also be laid rather thicker than upon copper. Warren tried several different menstrua, but that of which he most approved consisted of half an ounce of crystallised nitrate of copper, dissolved in a pint and a half of distilled water, with a few drops of nitric acid added to the solution. Various other menstrua have been since used.

In the application of steel engraving to matters of fine art, the accomplishment of mezzotinting upon steel plates is one of the most important points, as the wear of copper plates engraved in this manner is very rapid. In engravings in mezzotinto on steel, the tones are far better defined than those obtainable upon copper. From the superior density of the metal, the clearness of the lighter tints is carried to much greater perfection; and, from the same cause, the darks have also a decided preference, being distinguished by their superior richness.

To preserve steel plates from injury by rust, it has been recommended to smear their surface with sheep's suet rubbed on while the plate is warm. Some use virgin wax for the same purpose, heating the plate to such a degree that a cake of wax, when gently rubbed over it, leaves a thin but perfect film upon it.

The cost of engraving upon steel is considerably greater than that of engraving upon copper; yet, as steel plates afford so many more impressions than copper, they enable the publisher, by calculating his returns upon a large instead of a small number, to issue works of art at so low a price as to ensure a very wide circulation.

STEELE, SIR RICHARD, was born at Dublin in 1671. His father, who was private secretary to James, first duke of Ormond, sent his son to be educated at the Charterhouse in London; and thence, in 1691, to Merton College, Oxford. He was afterwards an ensign in the Guards, and in 1702 published 'The Funeral, or Grief à-la-Mode,' a comedy, successfully acted in that year. 'The Tender Husband,' acted in 1703, and 'The Lying Lover,' 1704, followed this first attempt. In 1709 he commenced 'The Tatler.' He was soon afterwards made one of the commissioners of the Stamp Office. In 1711 he began, in conjunction with Addison, 'The Spectator,' and in 1713 'The Guardian.' In 1713 he joined the opposition party, resigned his situation in the Stamp Office, and was elected member of parliament for Stockbridge in Hampshire, for which he did not sit long, as, in March, 1714, he was expelled the House for two political papers, one of which appeared in the series published by him, called 'The Englishman,' and the other was 'The Crisis,' which were alleged to contain treasonable matter relative to the reigning family.

After the accession of George I., in 1715, Steele was made surveyor of the royal stables at

Hampton Court, and was knighted on the presentation of an address. The same year he was chosen member for Boroughbridge in Yorkshire, and appointed one of the commissioners of forfeited estates in Scotland. He sustained a considerable loss, nearly 10,000*l.* by his own account, by the revocation, in 1719, of the patent by which he was constituted governor of the royal company of comedians. In 1722 his comedy of 'The Conscious Lovers' was acted. Some time before his death he retired into Wales, to his seat at Llangunnor, near Caermarthen, where he died Sept. 1, 1729.

Steele has the merit of having originated a kind of periodical literature not before known in this country, and his contributions to it tended considerably to refine and improve the age in which he lived.

STEELYARD, in mechanics, a kind of balance or weighing-machine, consisting of a lever of unequal arms. The most common kind of steelyard, which is often called the Roman Balance, is a lever of the first order, and is used by suspending the article to be weighed from the end of the shorter arm, or placing it in a scale-dish from thence suspended, and sliding a determinate weight along the longer arm until the instrument remains in equilibrium in an horizontal position; the weight of the substance attached to the short arm of the lever being indicated by observing the position of the moveable balance-weight with respect to a graduated scale marked upon the long arm of the steelyard. A ring or hook is attached to the fulcrum, so that the instrument may be conveniently hung upon a fixed support, or if small, held in the hand; and a vertical index or pointer, similar to that attached to the beam of common scales is sometimes added. Many steelyards are supplied with a second fulcrum; the two being placed at different distances from the point to which the hook or scale is attached, and having their respective pointers and suspending-hooks on opposite sides of the lever. In using a steelyard of this kind, capable of weighing from one to sixty pounds, the fulcrum which is nearest to the middle is used if the article be under fifteen pounds; while, if it exceed that weight, the instrument must be inverted, and suspended from the fulcrum which divides the lever most unequally.

Various modifications of the steelyard have been contrived for delicate scientific purposes, or for adapting it to the purpose of weighing very heavy bodies; and a balance of this kind, capable of weighing with great nicety, was invented by Mr. Paul of Geneva. (See Gregory's 'Mechanics,' vol. ii., art. 'Steelyard.') In this machine either one weight, with two fulcra, or two weights with one fulcrum were used; and it is said to have been capable of indicating as little as one ten-thousandth part of the weight with which it was loaded. In a steelyard contrived by Mr. Patten, of Rhode Island, United States, for purposes for which much delicacy is required, the weight is attached to a sliding-box which traverses along the beam by means of a screw. The screw passes through the sliding-box, and is secured by bearings at its ends in a position parallel with the beam, and it is turned by a milled head.

Several ingenious bent-lever balances have been contrived, some of which, from the circumstance of the levers being of unequal arms, resemble the steelyard in principle. These, and the steelyard weighing-machines for ascertaining the weight of loaded carriages, are noticed under WEIGHING-MACHINE.

The balance known as the Danish or Swedish steelyard differs from that above described in having the weight fixed at one extremity of the lever, while the fulcrum itself is moveable.

Though probably not so ancient an invention as the equal-armed balance, the steelyard is an instrument of very early origin. Under the name of statera it was well known to the Romans, who often used a weight in the form of a bust. Vitruvius (book x., chap. 8) mentions the statera, and describes the principle on which it acts. Many Roman statera of brass still exist, some of which are very like the steelyards of the present day. From the manner in which the steelyard is mentioned in a curious tract published in 1578, it would appear that it was not at that time much known in England.

The portable weighing-machine, called the spring or pocket steelyard, is noticed under SPRING-BALANCE.

STEELYARD, MERCHANTS OF THE, a body of aliens who enjoyed various commercial privileges in England from an early period to the middle of the 16th century. [HANSEATIC LEAGUE.] They had a factory, which was called the Steelyard, or Steelhouse, situate a little east of Dowgate, between Thames Street and the river. In 1475 Edward IV. entered into a treaty with the Hanseatic League, under which treaty and their old charters the merchants of the Steelyard were enabled to monopolise certain branches of trade, in which they were exempted from duties payable by other traders; and by their combination and capital, they were doubtless formidable competitors in other branches of foreign trade.

In 1505 a rival interest was created, by a charter granted to the Company of Merchant Adventurers for trading in woollen cloth to the Netherlands; and the merchants of the Steelyard, whose monopoly had excited great discontent, and caused more than one riot, were eventually, in 1551, deprived of their privileges, which were declared to be illegal. The English Merchant Adventurers flourished on the ruin of the older incorporation, which however continued to linger until 1597, when the Emperor Rudolph having ordered the factories of the English Merchant Adventurers in Germany to be shut up, Queen Elizabeth directed the lord mayor of London to close the house occupied by the Merchants of the Steelyard.

STEEN, JAN, was born at Leyden, in 1636. His father apprenticed him to Nicholas Knupfer, a German artist of considerable note, at that time residing at Utrecht. He afterwards studied under Van Goyen, who gave him his daughter Margaret in marriage. Though Steen soon acquired great reputation, he did not gain sufficient to live with

comfort, because he spent much time on his pictures, which he finished with extraordinary care. He set up successively a brewery and a tavern, but failed in both attempts, owing to his idle and intemperate habits. The scenes which he saw while in the latter business, he transferred with unrivalled skill to the canvas. None of his contemporaries surpassed him in the naiveté of his compositions, in the expression and character of his figures, and the skilful distribution of light and shade. He died in 1689. Several of his finest pictures, which fetch very high prices, are in England.

STEENHA'MMERA, a genus of plants belonging to the natural order *Boragineæ*. *S. maritima*, the only British species, differs but little from *Lithospermum*, except in habit.

STEENVOORDE. [NORD.]

STEENWYK, HENRY, the Elder, was born at Steenwyk in 1550. He studied under his father, who was well versed in painting, architecture, and perspective; and also under John Fredemann, called De Vries. His favourite subjects were the interiors of Gothic churches and convents, frequently by night, when they were illuminated by flambeaux or tapers. He was a consummate master of chiaroscuro, and his lights and shadows are distributed with the greatest judgment. His pictures are usually enriched with figures by Breughel, Van Tulden, and other artists. His works are extremely rare, and highly prized all over Europe. To avoid the troubles of war, he retired to Frankfort, where he died in 1603 or 1604.

STEENWYK, HENRY, the Younger, son of the preceding, was born in 1585. He followed the style of his father, by whom he was instructed, and good judges have thought that he often equalled him. Vandyck, for whom he often painted the architectural and perspective backgrounds of his pictures, induced him to visit England, and introduced him to the court of Charles I., where he met with encouragement. He died in London, but in what year is uncertain. His widow, who had been instructed by her husband, retired to Amsterdam after his death, and practised painting there: her works were greatly esteemed and purchased at high prices.

STEEVENS, GEORGE, was born at Stepney in 1736. His father was a director of the East India Company. George Steevens was placed on the foundation at Eton, and became a scholar of King's College, Cambridge, in 1754. His first publication was the reprint in 1766, of 'Twenty of the Plays of Shakespeare, being the whole number printed in quarto during his Lifetime,' &c. The reputation which Steevens acquired from this publication led, no doubt, to his association with Johnson in the edition of Shakspere which appeared in 1773 with their joint names. In this edition his assistance was of essential service. He collated all the copies diligently; he restored many readings which had been tampered with by his editorial predecessors; and he adhered to the old copies, without attempting to regulate the metre according to the poetical creed of his day. In 1778 the second edition by Johnson and Steevens appeared, in which Malone had rendered some assistance; but Malone, in 1780, published a supplement containing the doubtful plays and the poems. This rivalry, in all probability, gave a new direction to the labours of Steevens. He dedicated himself to the production of another edition, proposing 'instead of a timid and servile adherence to ancient copies,' to proceed to the 'expulsion of useless and supernumerary syllables, and an occasional supply of such as might fortuitously have been omitted.' The edition in which this process was perfected was produced in 1793. His experiment was successful with a public not very critical, who were thus presented with what he called 'a commodious and pleasant text of Shakespeare.' That text remained undisputed in its authority till the publication of Malone's posthumous edition by Boswell in 1821, in which some attempts were made to adhere to the early copies; and no popular edition, conducted upon a different principle, appeared till that of Mr. Knight, in 1838. With the exception of his various editions of Shakspere, Steevens did not apply himself to any extensive work. He assisted Nichols in his 'Biographical Anecdotes of Hogarth,' and Isaac Reed in the 'Biographia Dramatica.' His ample means put him above the necessity of literary labour. His satirical tendency however found vent in the 'St. James's Chronicle' and the 'Critical Review,' which he made the vehicles of the bitterest attacks upon the literary characters of those to whom in private he was all smiles and courtesy. He died at Hampstead, in January, 1800; and was buried at Poplar, where his memory is graced by one of Flaxman's monuments.

STE'FANO (called *Fiorentino*) was born at Florence in 1301. He was a disciple of Giotto, whom, according to Vasari, he excelled. He was Giotto's grandson, by a daughter named Caterina. He was the first who attempted foreshortening, made improvements in perspective, and gave new variety of character and life to his heads. His most celebrated works in Rome and Florence have been destroyed, and no authenticated picture of his remains in Tuscany, 'unless,' says Fuseli, 'we except a Madonna, in the Campo Santo of Pisa, undoubtedly in a greater style than the works of his master, but retouched.'

STE'FFANI, AGOSTI'NO, was born, about 1650, at Castello Franco. In his youth he was a chorister at St. Mark's, Venice, but a German nobleman obtained his discharge and took him to Bavaria, where he bestowed on him a liberal education, the musical part of it under Ercole Bernabei, and finally got him ordained. Thenceforward he took the title of Abate, or abbot, by which he is now commonly known. His ecclesiastical compositions attracted the notice of Ernest, duke of Brunswick, father to George I. of England, who invited him to Hanover, made him director of his chamber music, and committed to him the management of the opera. The operas which he composed while occupying this post are forgotten; but his madrigals, motets, and more especially his duets, are still esteemed.

Steffani was not only a musician, but a statesman. He had a share in concerting the scheme for erecting the duchy of Brunswick-Lüneburg into an electorate, for which service the elector assigned him a handsome pension, and Pope Innocent XI. gave him the bishopric of Spiga. After this he no longer put his name to his compositions, but adopted that of his secretary, Gregorio Piva; and in 1708 relinquished his appointments in Hanover in favour of Handel. He died at Frankfort, in 1729.

STEIBELT, DANIEL, was born at Berlin, in 1755, where his father was a manufacturer of musical instruments. He was educated at the charge of William III. of Prussia. In his travels he visited Paris and London. In Paris he had the honour to introduce Haydn's 'Creation,' and published many works. In London he made a considerable stay, took many pupils, and produced much piano-forte music. He finally settled at St. Petersburg, where he was appointed Maître de Chapelle to the Emperor. He died there in 1823.

STEINFURT, [BENTHEIM.]

STELLA, JACQUES, was born at Lyon, in 1596; his father, François Stella, who was also a painter, died when he was only nine years old. After his father's death Stella is said to have had no other master. At the age of twenty he went to Italy, and at Florence he was employed by the Grand-Duke Cosmo II., who gave him apartments and a pension. After living seven years in Florence, Stella, in 1623, went to Rome, where he was, by some chance, thrown into prison, and while in confinement he amused himself with drawing on the wall, in charcoal, the figure of the Virgin with the infant Jesus in her arms, of such excellence as to attract the attention of Cardinal Barberini.

In 1634 Stella returned by Venice and Milan to France, with the intention of visiting Spain. Cardinal Richelieu however succeeded in detaining him in Paris, and gave him an annual pension of 1000 francs. In 1644 he was decorated with the cross of St. Michael, and was made principal painter to the king. He died at Paris in 1657.

Stella was an imitator of the style of Poussin. There are several good pictures by him in some of the churches of Paris, and there are a few at Lyon. The prints after Stella amount to several hundreds.

STELLA'RIA (from *stella*, a star), the name of a genus of plants belonging to the natural order *Caryophylleæ*, and the section *Alsineæ*. There are 67 species of this genus enumerated. Most of them are weeds, which are distributed over all parts of the world. Eight of them are found in Great Britain. In common with the whole order to which they belong, they possess no active properties. Few of them are thought worthy of cultivation, and when planted in gardens they require but little care. *S. holostea*, the greater Stitchwort, is a British species, and is the handsomest plant of the genus. *S. media* is the Chickweed, which is so common and abundant on road-sides and waste places all over Europe. *S. cerastoides*, and *S. scapigera*, are both of them British plants, and are sometimes cultivated in pots.

STELLÆ'TÆ, the name of a natural order of plants formed by Ray. The verticillate arrangement of the leaves of the plants of this order gives them a starlike appearance, whence the name. The order is called by Lindley *Galiaceæ*.

STE'LLIO, Cuvier's name for a genus of *Iguanians*, under which he arranges the following subgenera:—*Cordylus, Stellio, Doryphorus, Uromastix, Agama, Trapelus, Leiolepis, Tropidolepis, Leposoma*, Spix (*Tropidosaurus*, Boie), *Calotes, Lophyrus, Gonocephalus, Lyriocephalus, Brachylophus*, and *Physignathus*.

Cuvier defines the *Stelliones* to be those Saurians which have, with the general characters of the *Iguanians*, the tail surrounded by rings composed of great scales which are often spiny.

Mr. G. R. Gray places *Stellio* under the family *Agamidæ*.

STELLIRIDIANS, M. de Blainville's name for the third order of his *Actinozoaria*, comprehending those radiated animals which are commonly known as *Star-Fishes*, or *Sea-Stars*, and may be arranged under the great genus *Asterias* of Linnæus.

The following is M. de Blainville's definition of the order:—

Body generally depressed, wide, and regularly formed, at its circumference, into angles which are more or less sharp, often prolonged into lobes or rays perfectly similar, covered with a skin more or less sustained by calcareous pieces. Intestinal Canal provided with a single buccal orifice, unarmed, but surrounded by tentaculiform suckers. Ovaries radiated and opening at the margin of the mouth.

M. de Blainville remarks that this extremely natural order corresponds almost exactly to the genus *Asterias* of Linnæus; but it has become necessary to add to it the *Encrini*, which the latter author had arranged as species of *Isis*, or *Pennatulæ*.

The character of the order, according to M. de Blainville, rests—

1. On the nature of the skin, which is more or less flexible, although solidified by very diversiform calcareous pieces, and which present, at the buccal surface, a sort of vertebral disposition serving for locomotion.

2. On the absence of the anus from the intestinal canal, which last is no more than a stomach more or less lobated at its circumference.

3. On the constant termination of the ovaries, disposed in rays at the circumference of the mouth.

As to the form of the body, M. de Blainville admits that it is often very different, although it is always at least *regularly* polygonal; in fact, he adds, these angles, which are sometimes very obtuse, can be developed so that in the family of the *Ophiuræ* and *Comatulæ* they become true appendages in the form of long rays, sometimes even divided or dichotomized. This disposition has led to the comparison of these animals with stars.

Geographical Distribution.—Very wide. Few or no seas are without some species of the order.

For the general anatomy and physiology of these animals, see the 'Cyclopædia of Anatomy and Physiology.'

The Stelliridians are very voracious; their dilatable mouth and gullet are admirably adapted for securing the testaceous mollusks and other animal substances on which the family feed. When the prey is apparently disproportioned to the parts into which it is to be conveyed, the œsophagus or gullet, together with part of the stomach itself, can be protruded and everted so as to draw the desired food into the cavity by the application of the everted surface to it. Thus, the shell-fish is swallowed whole, and specimens still living have been taken from the cavity. At other times the juices of the prey are sucked out, and the exhausted bivalve is left dead with its shell gaping. The old supposition that the star-fish succeeded, in this last mode of feeding, by inserting a ray or finger into the gaping shell, and if it found the bivalve too strong for it, got rid of the difficulty and the ray at once, conscious of its power of reproducing another, seems not to be at all founded in fact. Star-fishes however have been detected in the act of sucking the juices of conchifera through perforations, and also with their mouths applied to the edges of the valves. From the apparently paralyzed state of the bivalves found in such situations, it has been conjectured that the star-fish introduces some deleterious secretion within the valves, and thus leaves the mollusk torpid and deprived of the power of closing its valves against the attacks of its destroyer. Star-fishes are considered, and not without reason, as great enemies to oyster-beds. But it is not on living prey alone that the star-fishes feed. They seem to assist materially in cleansing the sea from dead and decomposing animal matter. A human tooth has been found in the stomach of a star-fish.

The sea-stars are extremely tenacious of life, and are endowed moreover with the power of reproducing lost parts, or of parts voluntarily thrown off. Indeed the sudden and voluntary act of dismemberment by which many of the Stelliridians will save their central disk at the expense of their rays or arms must have struck those who have observed these animals in their native seas, as well as the length of time during which the severed parts still continue to be endowed with motion. This power of dismemberment seems to be carried to its fullest extent in *Ophiocoma* and *Luidia*, and we refer our readers to Mr. Forbes's account of the voluntary breaking up of these genera, especially the latter, in his highly interesting 'History of British Star-Fishes.'

With regard to the power of restoration, few collectors have not come into possession of a specimen with a budding or growing ray occupying the place of a lost one.

For the views of zoologists relative to the systematic arrangement of this group, see Link 'De Stellis Marinis;' Agassiz, Müller, Forbes, and others.

Fossil Stelliridians are very numerous; they occur in the chalk and limestone, the lithographic slate, the upper Ludlow Rocks, &c.

STEM, in Botany, is that part of the plant which seeks the light and developes itself in the air, forming its ascending axis, and grows in an opposite direction to the root or descending axis.

The stem, or ascending axis, is composed of fibrous, spiral, and cellular tissues, arranged in various ways, mostly assuming a cylindrical form, and having a perpendicular direction, and bearing upon it the various parts of the plant. Its form and direction are however subject to much variation in particular cases. In their internal structure stems present three principal modifications characteristic of the three great natural classes into which the vegetable kingdom is divided, namely, Exogens, Endogens, and Acrogens. The stems of Exogens are the most complicated in structure; they possess a central pith, and radiating medullary rays filled up with woody tissue, which is deposited in zones of yearly growth, and the whole is covered with an external bark. [EXOGENS.] The stems of Endogens possess no pith or medullary rays or bark, but the same tissues which exist in the exogens are distributed irregularly throughout the mass of the stem. [ENDOGENS.] In their mode of growth they also differ, for whilst the increase of the exogenous stem takes place from the centre towards the circumference, the endogenous stem deposits its tissues from the circumference towards the centre. In *Acrogens* the stem is mostly composed of cellular tissue, and only in a few of the higher orders does it possess a cylindrical form. Of these, the stems of Tree-Ferns are most conspicuous, which contain, in addition to the cellular tissue, both woody and vascular tissue in their structure. The mode of development of the stem of acrogens is also different from that of the others. 'Instead of its increasing by the deposition of matter originating in the leaves, it appears to be a mere extension of some common vegetating point, which becomes cylindrical and long, when it is capable of being acted upon by the influence of light, as in Ferns, Lycopodiaceæ, &c., which expands irregularly and remains flat and foliaceous in such orders as Hepaticæ and many Algæ, which developes in straggling threads in some of the latter, and which collects these threads into masses of reproductive matter in Fungi.' (Lindley, 'Natural System,' p. 395.)

Although the most common direction taken by the stems of exogenous and endogenous plants is vertical, yet a great number of them depart from this course, and on this account or for some peculiarity of form or function, they have received a variety of distinctions. In some plants the stem or primary ascending axis is never pushed above the surface of the earth, and hence stems thus formed are called *subterraneous*. These stems were mistaken by older botanists for roots, and this error is still frequently committed, but the mode of their growth and their structure will always at once distinguish the subterranean stem from the root.

The forms of the subterranean stem are the *Tuber*, of which a good example is afforded in the potato; the *Cormus*, which is only seen in endogenous plants; and the *Soboles*, or creeping stem,

which runs along horizontally under the surface of the earth, giving off at intervals roots and buds.

Those stems which appear above the surface of the earth are called *aerial*. Of these the following forms are commonly distinguished:—The *Root-Stock*, or *Rhizoma*, is a prostrate hardened stem, seen in the *Aspidium Filix mas*, *Pteris aquilina*, *Juncus effusus*, *Iris germanica*, *Nymphæa alba*, *Gratiola officinalis*, &c. The *Surculus*, or *Sucker*, is a branch which proceeds from the neck of a plant beneath the surface, and becomes erect as soon as it emerges from the earth. The *Stole* is only a modification of the sucker. The *Runner* (*Sarmentum*, *Flagellum*) is a long slender stem, running upon the ground and forming at its extremity roots and a young plant. This is seen in the strawberry.

STENAY. [Meuse.]

STENCILLING. [Paper-Hanging.]

STENDAL. [Magdeburg.]

STENELY TRA (Insects), the third family of Heteromerous Coleoptera in the arrangement of Latreille. *Helops*, *Cistela*, *Dercæa*, and *Œdemera* are examples. They are usually oblong convex insects, with long legs and antennæ, which are thickened at their extremities. They live under the bark of old trees, or on leaves and flowers.

STENO, NICHOLAS, was born in 1638, at Copenhagen, and there first studied the medical and other sciences. He afterwards studied three years at Leyden, and two years at Paris, and then travelled through the greater part of Germany and Italy. At Florence, Ferdinand II., grand-duke of Tuscany, appointed him his physician in 1667; and Cosmo III., the next duke, retained him in the same post. In 1669 Steno renounced the Lutheran faith and embraced the Roman Catholic religion. Soon after, Frederic III. of Denmark recalled him, but it was not till the accession of Christian V., who was more tolerant of Steno's new faith, that he accepted the professorship of anatomy at Copenhagen. He held the appointment for a short time and then returned to Florence, where, in 1677, he took orders, and was consecrated bishop of Heliopolis. He devoted himself to his religious duties, and continued sedulously preaching till 1686, when he died at Schwerin in Mecklenburg.

Steno is now known chiefly through the results of his anatomical labours, which, considering the short period occupied in them, were neither few nor unimportant. His principal work, 'On the Muscles and Glands,' &c., was published in 1664. A brief account of his researches is published in Haller, 'Bibliotheca Anatomica,' tom. i., p. 491.

STENOGRAPHY, or the art of short-writing, is a term compounded of two Greek words, στενὸς, contracted, and γράφειν, to write. The invention of stenography has by some authorities been ascribed to Cicero; and it was certainly practised by him on account both of its brevity and secrecy. He reminds his friend Atticus ('Ad. Att.,' xiii. 32) that he wrote by signs (διὰ σημείων). The art was communicated by Cicero to Tiro, his freedman, who made considerable improvements in it, and is said to have been likewise the first person who applied it to the purpose of taking down public speeches. Eusebius attributes the invention to Tiro. The oration of Cato relative to the Catilinarian conspiracy was preserved by means of shorthand. We are informed by Plutarch, in his 'Life of Cato' (c. 23), that on the occasion of delivering that speech, 'Cicero dispersed about the senate-house several expert writers whom he had taught to make certain figures, and who did, in little and short strokes, equivalent to words, pen down all he said.' The art was subsequently improved, and stenography became a fashionable accomplishment with the Romans. There is extant a work on the shorthand (*notæ* of the Romans) printed in Gruter's 'Collection of Inscriptions.'

The first English treatise on Stenography was published in 1588, by Dr. Timothy Bright, and dedicated to Queen Elizabeth. It was entitled 'Characterie, or the Art of Short, Swift, and Secret Writing;' and consisted exclusively of arbitrary characters, each of which represented a word. Two years afterwards appeared 'The Writing Schoolmaster,' in three parts, by Peter Bale. The system of Bale, like that of his predecessor Bright, was formed of arbitrary characters for words, instead of a combination of elementary marks or signs. Both systems were exceedingly crude, and difficult of attainment; requiring, as they did, for their practical application, a remarkable tenacity of memory; but they displayed great ingenuity as first attempts. The earliest effort to form a regular shorthand alphabet appears to have been made by John Willis, who, in 1602, published 'The Art of Stenographie, or Short Writing, by Spelling Characterie.' The work went through numerous editions. The alphabet was formed of difficult and complex characters, which were ill adapted for joining, their formation consuming treble the time required for forming the characters in any of the modern systems of moderate celebrity. Willis was followed by many imitators, none of whom however effected any material improvement. In 1618 appeared a treatise upon Stenography by Edmond Willis, which was followed in 1630 by that of Witt; in 1630 by that of Dix; and by a great number of others at short intervals. In 1753 was published the system of Mr. Thomas Gurney, which has since been so very extensively practised by various members of his family and others, in the houses of parliament, the courts of law, &c. Mr. Lewis, in his 'History of Shorthand,' observes, that it proves how the assiduous student of a bad system may outstrip the negligent pupil of a skilful master; as those by whom Gurney's system has been practised could only have attained eminence as shorthand writers by the exercise of the utmost diligence and perseverance.

Among the more recent systems, that of Dr. Byrom deservedly occupies a very prominent position. He succeeded in forming an alphabet at once simple, precise, and practicable, as well as in rendering the general details of his theory exceedingly clear and intelligible. His system was much superior to any which had preceded it. Though the treatise was completed by the year 1720, it was not published till 1767, after the

author's death. Since its publication it has been edited by several persons.

The system next deserving of notice is that of Taylor, which made its appearance in 1786, and is entitled 'An Essay intended to establish a standard for a Universal System of Stenography or Shorthand Writing.' This author's system is superior to that of Byrom in several particulars; but principally in a greater brevity and simplicity of the alphabet, and the facility with which the various characters may be joined to each other. Some useful practical improvements upon Taylor's system have been made in Mr. Harding's treatise on the art. Dr. Mavor's system, though it obtained considerable popularity, is inferior to that of Taylor, on account of his alphabet requiring a greater number of strokes of the pen, and the characters being more difficult of junction. Since the publication of Dr. Mavor's treatise many others have been published, of which those of Richardson and Clive are perhaps the best.

The foregoing remarks contain a brief history of stenography in this country; but there is scarcely a country in Europe which has not paid more or less attention to its cultivation.

We shall now give a brief summary of the principles of stenography, according to the system of Taylor, as improved by Harding.

The Alphabet.—The vowels are represented by points, a period standing for *a*, *e*, and *i*, and a comma for *o* and *u*. The single consonants of the shorthand alphabet amount only to sixteen, *c* and *z* being rejected as unnecessary, the former having both a hard and a soft sound, similar to *k* and *s*, as in the words 'command' and 'sentence;' *s* is therefore always substituted for *c* where the letter has a soft sound, and *k* where it has a hard sound: *f* and *v*, being similar in sound, are both represented by the same character. For the same reason, *g* and *j* are represented by one character, as are also *k* and *q*. Characters are also assigned to double consonants, such as *ch*, *sh*, and *th*. These double consonants conduce both to perspicuity and expedition. The vowels are distinguished from each other by their position. For instance, should the period be placed over the top of a consonant, it signifies *a;* if placed against the side, or opposite the centre of the consonant, it becomes *e;* if placed at the bottom *i*. The comma is *o* when placed in the same situation as the dot or period for *a*, and *u* when in the same situation as the dot for *e*. Where vowels have been generally omitted, either through the haste of transcribing remarks on any subject, or for expedition in following a speaker, they ought, where such a course is rendered necessary, to be supplied immediately afterwards, while the subject written is fresh in the recollection of the writer. In all words which have neither incipient, terminative, nor long vowels, no middle vowel should be expressed unless some peculiarity may render it expedient or necessary to deviate from this general rule. A word of more than one syllable, having a long vowel in it, must generally have that vowel expressed, because the long vowel being found in that syllable which is most distinctly heard in pronunciation, affords the greatest help in reading; at the same time however when a word of more than one syllable consists of several consonants, even the long vowel may be frequently omitted. The various characters of the alphabet represent, when placed by themselves, a number of small words. For example, the *a* or *an* is written by a dot; *the* and also *and* by a comma, the former being written above the line, and the latter below. The consonant b represents the word *be, by, been*; d, *do, did, done;* f, *off, of, if;* g, *God, give, go, good;* h, *have, he;* k, *know, known;* l, *Lord, all, will*, and so on throughout the alphabet. For the attainment of practical proficiency in the art, it is necessary that the alphabet should be acquired so perfectly as to be written correctly four times in a minute.

Prepositions and Terminations.—Prepositions and terminations are the letters or signs by which the first and last syllables of words are represented. The whole of the single and double consonants of the alphabet are employed in denoting the beginnings or endings of words; in which situations the letters are not joined to the other part of the word, but placed so close as to show their connection and prevent their being mistaken for separate and independent words. The letter *b* represents the prepositions *abs, obs*, &c.; and the terminations *ble, ible, bly:* the letter *d*, the prepositions *de* and *des*, and the terminations *dom, end, ened*, &c.: the letter *f*, the preposition *for* and the termination *ful;* and the other alphabetical characters are appropriated in a similar manner. Besides the consonants, several arbitrary marks are also used to denote the endings of words. In many cases a preposition and a termination together are all that are necessary to represent a word.

Arbitraries.—In the system of Taylor very few arbitraries, or distinct characters for certain words, are employed. They do not exceed twenty in number, and may generally be employed with advantage, which is more than can be said of the arbitraries of several other systems. The experienced shorthand writer may readily, and with much benefit to himself, increase the number of these marks as occasion may require. For instance, the individual who acquires the art of writing shorthand for the purpose of its practical application in a court of law, may readily assign arbitrary marks for such technical terms or lengthy words as are of most frequent occurrence; and so in other professions.

Mode of Spelling.—The great aim of shorthand being to represent words by the fewest simple characters possible, all letters which are not distinctly sounded in any word must be omitted, except in cases where their retention may seem necessary. If words are written as they are pronounced, every silent letter will of course be omitted. In following a speaker however it is necessary that all vowels should be omitted, or otherwise it will be impossible to take more than the substance of his remarks. Where however proper names occur, they should either have the vowels inserted or be written in longhand: the latter method is most advantageous, as the names, when so written, serve as rallying-points to the eye in deciphering shorthand notes. Where the

vowels are omitted in general writing, the rule is to write such of the consonants as are sounded in the pronunciation of any word.

Miscellaneous Modes of Abbreviation.—As in following a speaker all the vowels require to be omitted, and the consonants only written, so all the small words in a sentence are likewise left out. In some cases however, where the speaker is deliberate and the writer is expert, nearly all the words may be expressed. In the abridgment of sentences of course the writer is guided by his own judgment and the necessities of the case.

STENOPS, Illiger's name for a genus of his family *Prosimii*, the *Lemuridæ* of most zoologists. The genus *Stenops*, synonymous with *Loris* and *Nycticebus*, contains those singular animals generally known as Slow-Paced Lemurs, *les Loris Paresseux* of the French.

'The genus *Loris*,' says Mr. Bennett, 'forms part of that division of the quadrumanous order which is essentially distinguished by an unequal number or irregular disposition of the incisor teeth in the two jaws; terminal nostrils with sinuous openings; and a long subulate or sickle-shaped claw upon the fore-finger of the hinder hands, all the rest of the nails being flat and rounded like those of the greater part of the monkeys and of man. The Loris differs from the other genera of this family in having four incisors in the upper jaw, placed in pairs with a vacant space between, and six in the lower, directed obliquely forwards; canines of moderate size; twelve molars above and ten below; a short rounded head and little or no tail. Sometimes, it would appear, the lateral incisors of the upper jaw, which are always smaller than the others, are either entirely wanting or so minute as not to be easily seen. But M. Geoffroy was enabled to detect them in the identical specimen which Vasmaer had declared not to possess them; and it is by no means improbable that future investigators may ascertain their existence in the stuffed individuals sent from Java by M. Leschenhault, of which M. Geoffroy has made a new species, principally on account of the supposed absence of these teeth. In addition to these primary characters, the Loris are distinguished by large prominent eyes, placed in front of the head, and at no great distance from each other; short ears, scarcely rising through the hair with which they are invested; a rough tongue; nostrils projecting beyond the mouth and surrounded by a naked muzzle; and thumbs widely separated from the fingers, both on the fore and hinder hands.'

Locality, India, Java, Sumatra, Ceylon. Habits nocturnal. Movements slow, and creeping. The food consists of fruits, eggs, insects, and even small birds. At night, these creatures become very animated, and their large eyes glisten vividly.

'These animals have been long celebrated for the slowness and caution of their movements, to which may be added a remarkable tenacity of grasp, in conjunction with the power in the limbs of exerting a long continuance of muscular contraction. In the main arteries, both of the anterior and posterior extremities, there is a peculiarity, first detected by Sir A. Carlisle, and met with in the limbs also of the sloth and a few other instances. No sooner has the main artery, a single tube, reached the commencement of the limbs, but it assumes another character: instead of continuing its course as a simple tube giving off branches as it proceeds (the usual mode), it becomes suddenly divided into a congeries of small tubes, intertwined together, and communicating with each other freely, thus forming an elongated plexus, which may act as a sort of reservoir, and carry onwards a large volume of blood. The relation of this plexus to the bulk of the limb it supplies with blood, is greater in point of volume than that of the simple artery in ordinary animals.' ('Museum of Animated Nature.')

The Slender Loris (*Loris gracilis*) is a small species, about twelve inches in the length of the body, covered with soft fur of a brownish gray, with a dark chestnut circle round each eye. It is a native of Ceylon.

Slender Loris (*Loris gracilis*).

The Slow Loris (*Loris tardigradus*). This species equals a small cat in size. Its proportions are short and thickset; and the apparent clumsiness of its form is much increased by the manner in which it usually contracts itself into a kind of ball. Its head is broad, flat, and rounded, with a slightly projecting and pointed muzzle, in which the nostrils are perforated laterally. Its eyes are large and perfectly orbicular, furnished with transverse pupils capable of being entirely closed during the day, and of being very largely dilated at night; their inner canthus is situated so low towards the nose that the motion of the eye-lids appears to take place in a diagonal instead of a horizontal direction. Little or nothing certain appears to be known of the habits of the Slow Lemur of Bengal in a state of nature, except as they may be inferred from those which it exhibits in captivity.

The Slow Loris is found in Hindustan, Java, Penang, and Ceylon. During the day it sleeps in a crouching attitude, with the head brought forward between the forelimbs, which are pressed against the abdomen. At night it rouses up in quest of prey.

Mr. Baird, in the 'Magazine of Natural History,' vol. i., 1829, remarks that all the known *Mammalia* close their eyelids in a direction upwards and

downwards, and, in general, the upper eyelid is the one possessing the greatest degree of motion. He found however that in his Slow-Paced Lemur, the eyelids were brought together in a diagonal direction, or outwards and inwards, which gave the animal at the moment of shutting its eyes a most peculiar look. It was the under or outer eyelid that had the greatest degree of motion, the upper or inner one being almost fixed; and he concludes that the orbicularis muscle must be very powerful. After the death of the animal, and when Mr. Baird had left this country on a second voyage to India, the eye was dissected by Dr. Knox, who found that the peculiar movement of the eyelids above described did not depend on any peculiar structure, but merely on the greater degree of strength of the orbicularis muscle.

Mr. Baird also observed another peculiarity in the species. 'Beneath the tongue proper,' says he, 'if I may so call it, which is somewhat like that of the cat, though not rough, is another tongue, white-coloured, narrow, and very sharp-pointed, which he projects along with the other one when he eats or drinks, though he has the power of retaining it within his mouth at pleasure.' Mr. Baird however had not been able to see any particular purpose to which he applied it; but he saw him use this double tongue when eating flies, of which he was exceedingly fond, snapping them up most eagerly when presented to him, and catching them himself when they were reposing in the evening upon the walls of the room.

STE'PHANUS BYZANTI'NUS, a Greek grammarian, the author of a geographical dictionary, the earliest probably ever written. Nothing is known of his life, and his age is uncertain; he is placed by Saxius ('Onomasticon,' i. 529) in the latter part of the fifth century. Of his original work nothing but an abridgment made by Hermoláus, another grammarian who lived in the time of the emperor Justinian, has come down to us with the exception of a fragment of the letter Δ beginning with Dyme and ending with Dodóna, which was first published from the 'Bibliotheca' of Peter Seguier, by Samuel Tennulius, Amstel., 1689, 4to. A comparison of this portion of the original work with its abridgment will show how much valuable matter has been omitted by Hermoláus. The title of the work of Stephanus, which the later editors have adopted, is 'Ethnica,' instead of that of Περὶ Πόλεων, or 'About Cities,' prefixed to the edition of Aldus and others. There are many editions of Stephanus: by Aldus Manutius, Gesner, Xylander; Thomas de Pinedo, Amsterd., 1678, with a Latin translation and useful commentary; and by A. Berkel, Leyden, 1688. This edition was finished by Gronovius, 1694, who republished the fragment with a triple Latin translation in the 'Thesaurus Antiq. Græc,' vol. vii. The last edition is by A. Meineke, Berlin, 1849, of which only one volume containing the text has yet appeared (1850).

The work of Stephanus contains many interesting particulars relative to history and mythology. It treats of towns, nations, and tribes, giving to each proper name its gentilitial adjective. It does not however appear, as some have supposed, that the chief object of the author was to convey grammatical information. The number of authors cited in the fragment makes us the more regret the loss of so valuable a compilation as the whole work must have been. The notices of cities in the 'Epitome,' particularly of those which struck coins, are very useful in the illustration of the local history and topography of the ancient world.

STEPHEN, the first Christian martyr, has been supposed, on no very sufficient grounds, to have been one of the 'seventy-two disciples.' It is more likely that he was an Hellenistic Jew, and one of the large body converted on the day of Pentecost by the preaching of St. Peter. He appears to have been a person of some reputation, and was one of the seven deacons chosen to attend to the temporal affairs of the church. The Jews lost no opportunity of contending with him; and ultimately brought him before the Sanhedrim, to give an account of his belief. In answer, he commenced a fine oration, which was interrupted by the mob, who 'were cut to the heart, and gnashed on him with their teeth.' He was however encouraged by a vision of 'heaven opened,' and of Christ glorified; on declaring which to the people, they rushed upon him, dragged him outside the city, and there stoned him to death, A.D. 33. With his last breath he invoked the pardon of God for his murderers.

STEPHEN I. and II. [POPE.]

STEPHEN III., a native of Rome, was elected (A.D. 752) the successor of Stephen II., and is styled by many Stephen II. Astolphus, king of the Longobards, having shortly before driven the Byzantines out of Ravenna, the Exarchate, and Pentapolis, marched towards Rome, in violation of the peace concluded between his predecessors and that see, and having advanced as far as Narni, sent messengers to the pope, requiring the inhabitants of Rome and its duchy to pay him a capitation tax, and acknowledge him for their liege lord, threatening to pillage Rome in case of refusal. Stephen however was protected by Pepin, king of the Franks, who besieged Astolphus in Padua, and obliged him to promise to give up Ravenna with the Exarchate. In the following year however Astolphus marched to Rome, to which he laid siege. Pope Stephen now wrote to Pepin in the most urgent manner in the name of St. Peter, promising him and all the French people eternal life, if they would support the rights of St. Peter's see. Pepin quickly repaired to Italy, obliged Astolphus to raise the siege of Rome, defeated him, and besieged him in Pavia. Astolphus was obliged to sue for peace, and to deliver up the towns of the Exarchate and Pentapolis, which Pepin bestowed upon the pope.

Soon after this memorable transaction Astolphus died of an accident while hunting, and Desiderius, king of Tuscany, was chosen by the Longobards for their king. In the following year (April, 757) Pope Stephen died, and was succeeded by Paul I. We have of Pope Stephen's writings, besides his letters in the 'Codex Carolinus,' his 'Responsa ad Gallos,' in Harduin's 'Concilia.'

STEPHEN IV., styled III. by some, a Sicilian by birth, was elected pope A.D. 768, more than a

year after the death of Paul I., on the deposition of one Constantine, a layman, and brother of Toto, duke of Nepi, who had intruded himself by force on the papal see. Shortly after Stephen's accession an insurrection broke out, which he quelled with the assistance of Desiderius, king of the Longobards. The next event of importance was his protest against the proposed marriages of Charles and Carloman, who succeeded Pepin as kings of the Franks, with two daughters of Desiderius, a protest however which failed as far as Charles was concerned.

Stephen, in the latter part of his pontificate, was at open variance with the king of the Longobards, who kept or recovered possession of Ferrara, Comacchio, and Faenza, which formed part of the long-disputed Exarchate. Stephen died in 772, and was succeeded by Adrian I.

STEPHEN V., VI., VII., VIII., IX., and X. [POPE.]

STEPHEN, ST., first king of Hungary, son of the Magyar chief Geysa, was born about 979, at Gran (*Estragan*, the ancient Strigonium). On the death of his father, in 997, while he was in the midst of preparations for a powerful attack upon his heathen countrymen, Stephen and his little band of Christian adherents found themselves pressed on all sides by the enemies of their religion. Stephen however in the end proved victorious, and by a dispensation of Pope Sylvester II. was made king of Hungary with unlimited ecclesiastical powers. The coronation took place Aug. 15, 1000.

After having repressed the rebellion of his cousin in 1002, and repelled an invasion of the Bulgarians, the whole of Stephen's attention was given to the establishment of Christianity. He divided Hungary into ten bishoprics, which were plentifully supplied with monasteries built by Greek architects. Schools were also established, the first and best of which was that of St. Gerard, who had been tutor to Prince Emeric, the king's son. These and many other pious and charitable institutions of St. Stephen, joined to his own exemplary life and precepts, soon rooted out the remnants of paganism. His constitution, which was undoubtedly the foundation of the Hungarian government, but of which we have no well-authenticated remains, finished the work of civilisation which he had begun thirty years before.

At this period of his life, being fifty-one years of age, he lost his son Emeric, and Vazul, whom he had designed for his successor, was deprived of his eyes by the Queen (Gisela, sister of the emperor Otho III.), in order that her own son Peter might succeed to the throne. These causes of sorrow so affected Stephen's health that they brought on an illness which afflicted him till his death, Aug. 15, 1038. An attempt had shortly before been made on his life by a hired assassin. In 1083 his relics were enshrined by St. Ladislaus, in a rich chapel which bears his name, in the church of Our Lady at Buda, and he was canonised by Benedict IX.

STEPHEN II., king of Hungary, was the son of Koloman, whom he succeeded in 1114, at the age of fourteen. He was of a weak intellect, but self willed and impulsive. Soon after his accession to the throne he made war on the Venetians, who could not be reconciled to the loss of Dalmatia, which had been taken from them during the reign of Stephen's father. The hostilities, which lasted two years, ended with a treaty which secured the mainland of Dalmatia to Stephen, whilst Venice obtained the adjoining islands. In 1117 and 1118 Stephen invaded Poland and Austria, from which expeditions he derived no material benefit. In 1119 he resolved upon an incursion into Austria, but the Hungarian army was completely beaten by the Emperor Leopold.

Stephen excited general indignation against himself by filling the country with foreigners, to whom he showed a decided preference. This foolish policy was followed, in 1127, by a war with the grand-duke of Muscovy, Wladimir Monomakh. The unjustifiable aggressions of Stephen in Russia, whither he had gone to aid the exiled Prince of Wladimir, were only stopped by the threats of his nobles to deprive him of his crown if he did not return to Hungary. On his return his conduct compelled many of his subjects to fly to Constantinople, where they were well received by the Emperor John II., who, upon Stephen's threatening to invade the Empire, sent a powerful army against him, which defeated the Hungarians at Uj-Palanka. Stephen resigned the crown in favour of his relative Bela in 1131. He then entered a monastery, and died at Waradin, in the thirty-first year of his age.

STEPHEN III. was crowned king of Hungary in 1161, but the emperor of Greece, Manuel, signified to the Hungarians that unless they elected Ladislaus, the brother of the late king, he would invade the country. Terrified by the approach of a formidable army, the Hungarian nobles elected Ladislaus, who however died in 1161.

STEPHEN IV. On the death of Ladislaus, Stephen IV. was forced upon the Hungarians by the Emperor Manuel. A revolt soon compelled him to seek refuge at the court of his patron, and Stephen III. was unanimously re-elected. On his refusal however to admit the emperor's claim to Dalmatia, his uncle, Stephen IV., re-appeared at the instigation of Manuel, and commenced hostilities. He was however defeated, and obliged to fly to Semlin, where he died in 1163. Soon after his death Dalmatia was recovered from the hands of Manuel by Stephen III.; but whilst engaged in the western part of his kingdom a Greek army appeared in Hungary. Stephen went to meet it; and a decisive battle, in which the Hungarians were defeated, secured the influence of Greece in Hungary. Stephen died in 1173, and was succeeded by his brother Bela III.

STEPHEN V., king of Hungary, succeeded his father Bela in 1270, and began his reign by a war against Ottocar, king of the Bohemians, whom he defeated. A subsequent campaign against the Bulgarians was crowned with success; but the course of his victories was interrupted by his death, which occurred in 1272.

This king is sometimes called Stephen IV. by those who do not recognise the usurper of that name.

STEPHEN, king of England, born in 1105, was the third of the four sons of Stephen, earl of Blois, by Adela, daughter of William the Conqueror; and was consequently nephew of Henry I., who procured for him in marriage Matilda daughter and heiress of Eustace, earl of Boulogne (younger brother of the famous Godfrey and Baldwin, kings of Jerusalem).

In 1125, immediately after the death of her first husband the Emperor Henry V., Henry sent for his daughter Matilda to Normandy. The next year he brought her over to England, came to London, and in a council consisting of the archbishops, bishops, abbots, earls, and all the thanes, obtained, in Jan., 1127, the unanimous promise of the assembly, which included Stephen and the Earl of Gloucester, Henry's natural son, that, if he should die without male issue, they would receive Matilda as his successor. Nevertheless, as soon as Henry had expired in Normandy, Dec. 2, 1135, Stephen, who, as well as Gloucester, had been in attendance on the dying king, set out for England, and landed on the coast of Kent. Stephen had already secured the support of a powerful faction of the clergy and nobility; and although refused admission by the inhabitants both at Dover and at Canterbury, he was received with welcome by those of London and Winchester. Hugh Bigod, earl of Norfolk, the steward of the royal household, having boldly sworn that Henry on his deathbed had disinherited his daughter, and left the crown to his nephew, it was resolved by the clergy and nobility who had gathered about him that he should be crowned forthwith. The ceremony was accordingly performed at Westminster, Dec. 26, by the archbishop of Canterbury.

The bishops however tendered their allegiance only for so long as the king should maintain the privileges of the church; and the lay barons appear to have also qualified their oath by a similar condition as to his preservation of their estates and honours.

In January, 1136, after seeing the body of the late king interred at Reading, Stephen convened a great council of the bishops and the nobility at Oxford, and there signed a charter of the liberties of the church and state. He had shortly before this obtained a bull from Pope Innocent, confirming his election. Meanwhile a feeble attempt had been made by Matilda and her second husband, Geoffrey Plantagenet, son of the Earl of Anjou, to take possession of Normandy; but the Normans themselves, without any assistance from Stephen, soon drove out the army of Angevins which had entered their country. In the spring of 1136 King David of Scotland, Matilda's uncle, overran the northern counties, and compelled the barons of those parts to swear fealty to Matilda. An insurrection in favour of Matilda also broke out in Wales; and it soon appeared that Stephen's possession of Normandy was only to be retained by force of arms. In some districts of England the standard of Matilda was raised by the Earl of Gloucester, and various places of strength were seized upon and garrisoned in her name. Stephen had his hands full of work with all this disorder

and rebellion in the south, when the King of Scotland again appeared on the northern borders. He was however defeated in the famous battle of the Standard, Aug. 22, 1138, near Northallerton; but peace was not concluded with the Scots till April 9, 1139.

By this time the English king had found another and more formidable enemy. He had quarreled with the church. Resolved to reduce the inordinate power of Roger, bishop of Salisbury, and his two nephews, Alexander and Nigel, bishops of Lincoln and Ely, he had at a council held at Oxford, in June, 1138, arrested Roger and Alexander; and although Nigel made his escape, he was compelled to surrender his castle of Devizes, and his brother and his uncle gave up theirs of Newark, Salisbury, Sherburn, and Malmesbury. Stephen was summoned before a synod of bishops, which met at Winchester. Stephen sent one of his ministers to plead for him, who, when the decision upon a preliminary question had been given against the king, appealed to Rome; on which the king's brother, the Bishop of Winchester, who had lately been made papal legate, dissolved the synod, Sept. 1, 1139. On the last day of the same month Matilda landed on the coast of Suffolk, and immediately after the Earl of Gloucester unfurled his standard in the west. The war spread rapidly over the whole kingdom. At length, Feb. 23, 1141, Stephen, while besieging the castle of Lincoln, which was held by Ranulph, earl of Chester, was attacked by the Earl of Gloucester, taken prisoner, and consigned in chains to the castle of Bristol.

Matilda was now acknowledged as queen; but the folly, rapacity, and insolence which she displayed in her triumph, were soon found to be insupportable by all parties. Taking advantage of the strong popular feeling of disgust, Stephen's queen Matilda, who had remained in arms for her husband in the county of Kent, made her appearance before London. Matilda fled to Oxford, and in the conflicts that followed, the Earl of Gloucester having being taken prisoner, was exchanged for Stephen. When his brother was thus again at liberty, the legate, who had previously persuaded the clergy to acknowledge Matilda, once more summoned a clerical synod at Westminster, Dec. 7, 1141, at which he gained them over to the cause of her rival.

The war recommenced after Stephen had recovered from an illness which confined him for some months. The kingdom remained subject generally in the eastern counties to Stephen, in the western to Matilda, till the death of the Earl of Gloucester, the main support of the latter, in 1146, upon which she retired to Normandy. The next two or three years of Stephen's reign were disturbed by a rebellion headed by Ranulph, earl of Chester, and also by another quarrel with the clergy, in consequence of which the whole kingdom was laid under an interdict. But Stephen's last and worst antagonist now appeared in the person of Matilda's son Henry, who, having by the death of his father, in Sept., 1151, become Earl of Anjou, landed at Wareham, Jan. 6, 1153. He was met by Stephen near Wallingford, and

both parties were preparing for battle, when an agreement was made, which was confirmed in a great council held at Winchester in November following. By this compact, Stephen, whose eldest son Eustace, fortunately for the peace of his country, died suddenly at Canterbury during the negociation, constituted Henry, whom he styled Duke of Normandy, 'his successor in the kingdom of England, and his heir by hereditary right;' Henry in the meantime acknowledging Stephen as king. Stephen survived its ratification not quite a year; he died suddenly in a convent at Dover, October 25, 1154. [HENRY II.]

STEPHEN BATHORI, king of Poland, was born in 1533, at Shomlo in Hungary, of a noble family. The agitated state of his native land during the 16th century, presented a field for the display of great talents, united to a daring and adventurous character, and Stephen Bathori rose to the sovereignty of Transylvania in 1571. In 1575 he was elected to the throne of Poland, vacant by the flight of Henry of Valois (Henri III. of France); and having regulated the internal affairs of the country, he settled its foreign relations in a satisfactory manner. He then turned his attention towards Muscovy. This power had recently obtained an extraordinary development under the celebrated Ivan Basilovich, who invaded a part of Livonia belonging to Poland shortly after the accession of Stephen. Having completed his military preparations, he took the field in the summer of 1579 with a numerous army composed of national troops, German mercenaries, and five thousand Hungarians. The Muscovites were defeated in several battles. Polotzk, which had been taken from Poland several years before, was recovered after a desperate resistance; and having obtained some other advantages during the same campaign, Bathori returned in the winter to Warsaw. The war was resumed with great vigour in the summer of 1580; the town of Veliki Luki and several others were taken; and in the next year, 1581, the city of Plescow was besieged by Zamoyski, to whom Bathori had entrusted the command of the army. Bathori however concluded peace with Muscovy, Jan. 6, 1582; and he employed the interval of peace in introducing improvements, and making preparations for another war with Muscovy. But the projects of Bathori were cut short by his death, at Grodno, Dec. 12, 1586.

The wars in which he was engaged did not prevent him from paying attention to the civil affairs of the country, in which numerous improvements were introduced during his reign. He was very fond of learning and a great patron of learned men.

STEPHENS (French, ETIENNE or ESTIENNE; Latin, STE'PHANUS) is the name of a family of illustrious scholars and printers.

Henry Stephens (1) was born at Paris, probably about 1470. His earliest printed work is said to be one of the year 1502. The works which he printed were chiefly on theological, philosophical, mathematical, and medical subjects. All his books are very correctly printed. He died in 1521 or 1522.

Francis Stephens (1) was the eldest of the three sons of Henry Stephens. He was a partner of Simon de Colines. There are very few books known to be printed by him. The earliest is a work called 'Vinetum,' printed in 1537. The last of his publications is the 'Andria' of Terence, in 8vo. The year of his birth as well as of his death are unknown.

Robert Stephens (1) the second son of Henry Stephens (1), was born at Paris in 1503. He studied the Latin, Greek, and Hebrew languages, and was an excellent scholar. After the death of his father, he was for some time engaged in the printing-office of Simon de Colines, his father-in-law. Robert Stephens married Petronella, a daughter of the scholar and printer, Jodocus Badius, a woman of great talents, who understood and spoke Latin well. The earliest work that he printed on his own account was, according to some, 'Apuleii Liber de Deo Socratis,' 1525, 8vo. This was followed by Cicero's 'Partitiones Oratoriæ,' and a great number of other works, which rapidly issued from his press. For most of these works he acted both as editor and corrector of the press. The mere list of his publications in Maittaire, from 1527 to 1560, fills twenty large octavo pages, and it is not complete. In 1531 he began the publication of his 'Dictionarium, seu Latinæ Linguæ Thesaurus,' the last edition of which is in 2 vols. folio. In 1539 Stephens was appointed printer to the king of France for Latin and Hebrew works, and shortly after for Greek works also. The first Greek book that Stephens printed, in his capacity of royal printer, belongs to 1540. In 1545 he published his edition of the Latin Bible, and in the next year his first Hebrew Bible. His repeated editions of the Bible, and the notes to his Latin Bible, which were supposed to favour the reformed doctrines, involved Stephens in disputes with the Sorbonne, who charged him with heresy or at least error. But the indefatigable printer still continued his labours, and brought out among other works the Editio Princeps of the 'Antiquitates Romanæ' of Dionysius of Halicarnassus. The death of king Francis I., in 1547, deprived Stephens of a protector, for his successor Henry II. was too weak and unsteady to support him against his enemies. The Sorbonne again attacked him about his Bibles, and finally the Sorbonne succeeded in getting the sale of his Bibles prohibited. At last, to escape from further persecutions, this eminent scholar removed with his family to Geneva in the beginning of 1552, and there carried on his printing unmolested. He died in 1589, leaving a large family and considerable property. Three of his sons, Robert (2), Henry (2), and Francis (2), are noticed here.

Charles Stephens appears to have been about a year younger than his brother Robert. He had an excellent classical education; but he also applied himself to the physical sciences, and took his degree of doctor of medicine, which he practised for some time. He wrote several treatises on medicine, natural history, and agriculture; but he treated his subjects chiefly in relation to antiquity. His earliest productions are abridgments

of works by Lazarus Baifius, such as 'De Re Vestiaria;' 'De Vasculis;' and 'De Re Navali,' which were published by Robert Stephens (1535 and 1537). In 1551, when Robert removed to Geneva, the whole of his printing establishment, with the exception perhaps of the department for printing Hebrew, passed into the hands of Charles Stephens; for the Editio Princeps of Appian, which appeared at Paris in 1551, is probably the first book which he printed. It is a beautiful specimen of typography. Soon after Robert left Paris, Charles appears to have been appointed royal printer. He died in 1564. He lost a great deal of his capital in 1557, by the publication of his 'Thesaurus Ciceronianus,' which was a very expensive undertaking, and did not sell.

Lists of the numerous works which were written or printed by Charles Stephens are given by Maittaire and Renouard.

Henry Stephens (2) was the son of Robert and grandson of Henry. He was born at Paris in 1528. As a child he showed most extraordinary talents. Latin he learnt early, as it was constantly spoken in the family, but before he seriously studied it his father made him learn Greek. After receiving some instruction in Greek from a schoolmaster, he was taught by Petrus Danesius, who was then, next to Budæus, perhaps the ablest Greek scholar of the time; and who, on account of his intimate friendship with Robert Stephens, took great interest in the progress of his pupil. At the age of about fifteen Henry also enjoyed the instruction of Jacobus Tusanus (Jacques Toussain); and subsequently, when this scholar died (1547), that of Adrianus Turnebus, who succeeded Tusanus in the professorship of Greek in the Royal College.

In 1546 Henry began to assist his father by collating a MS. of Dionysius of Halicarnassus, whose works Robert was preparing for publication. He also undertook a journey to Italy, the main object of which was to search the libraries and examine the manuscripts in that country. Three years were spent in visiting various parts of Italy. In this journey he became acquainted with Muretus, P. Manutius, C. Sigonius, and other distinguished Italian scholars. He returned to Paris in 1549. In 1550 he visited England, when he was well received by King Edward VI.; and on his return from England he visited the Low Countries, and during his short stay there he learned the Spanish language.

The first indication of a printing establishment belonging to H. Stephens occurs towards the end of 1556, when he published some of the Psalms of David translated into Latin verse; but before this year he had made a second visit to Italy. In the course of the year 1557 Stephens was in full possession of a printing establishment, and he published seven works, among which was an edition of Æschylus. The travels of Stephens and the printing of expensive works embarrassed him, but he was assisted by Ulric Fugger, a wealthy merchant of Augsburg, who gave or advanced to him a large sum of money. This connection however ceased in 1576 with the merchant refusing to advance any more.

On the death of his father at Geneva in 1559 the printing establishment then came into the hands of Henry, who appears to have given up his establishment at Paris. He first married in 1555, and on becoming a widower he married again, but he survived his second wife, and at his death in 1598 he left a widow.

From 1560 to the time of his death Stephens was busily engaged as a scholar and a printer. On his great work the 'Thesaurus Linguæ Græcæ,' he spent ten years; and in 1572 it was published, with the appendix and index, 5 vols. folio. This work made an epoch in the history of Greek philology, as well as in the life of the author, who had embarked in it nearly all his property. The price of this prodigious work was necessarily high, and accordingly it could not have many purchasers. When Scapula some years afterwards published his cheap abridgment [SCAPULA], the sale was nearly stopped, and Stephens became involved in great difficulties. In 1745 Daniel Scott published, in 2 vols. folio, 'Appendix ad Thesaurum ab H. Stephano constructum.' A new edition of the Thesaurus was published in London (1815-1828) in 7 vols. folio, with numerous additions by Barker. A new edition is now (1850) in course of publication at Paris.

It appears to have been owing to the pecuniary difficulties in which Stephens was involved after the publication of his Thesaurus, that, in order to divert his mind, he made various excursions in France and Germany, but he always took the opportunity of exploring libraries and comparing MSS., and thus collected vast quantities of materials for works which he was publishing or projecting. Towards the end of 1578 he went to Paris, when King Henry III. received him very kindly; and in subsequent years he spent a great deal of his time in that city. His publications during this period greatly decreased in number, and some of them were executed by Paris printers. His own establishment at Geneva was neglected. He was constantly travelling about, and he published his works wherever he happened to be, as at Paris, Frankfort, Basel, &c. He often resolved to give up this wandering life, and was seriously exhorted by his friends to attend to his business; but the charms of a court life and the habit of travelling had now become strong, and he was dazzled by splendour and deceived by the hopes which he placed in the great. The years 1588 and 1589 he appears however to have spent at Geneva, and several works again issued from his press; but in 1590 no work came out at Geneva, and only one ('Principum Monitrix Musa') at Frankfort, where he appears to have spent some time. In this year Henry III. of France was murdered. The affairs of Stephens now grew worse and worse: his warehouses were full of books which he could not sell. In the year 1597 he left Geneva for France. He first staid for some time at Montpellier, where Florence, one of his daughters, resided, who was married to Isaac Casaubon. Casaubon was just preparing his edition of Athenæus, and Stephens offered his assistance, which was refused. He then proceeded through various other places to Lyon, where he was taken

ill; and feeling solitary and forlorn, and having no friends there, he was carried to a public hospital, where he died, in the beginning of March, 1598, at the age of nearly seventy years. It is a mistake to suppose that Stephens died in poverty because he died in an hospital; for the proceeds of his books alone, which were publicly sold and fetched low prices, were sufficient to pay his creditors, and to leave something for his wife and children. Stephens died without a will; and Casaubon, who went to Geneva to receive his wife's dowry, which was still owing, together with her share of the inheritance, was generous enough to leave Henry's library, MSS., and printing establishment, in the hands of his son Paul.

There is no scholar to whom students of the Greek language and literature are under greater obligations than to Henry Stephens. The number of books which he printed, edited, or wrote, is immense; and it is truly astonishing that, even during the rambling life of his latter years, he was continually producing new works.

Robert Stephens (2), the youngest son of Robert Stephens (1), and brother of Henry Stephens (2), was born at Paris in 1530. In 1556 he and Morel, who was then royal printer, published the edition of Anacreon prepared by H. Stephens. The title of royal printer was conferred upon Robert in 1561, as appears from some books printed by him in this year, at the same time that he came into possession of the printing-office of Charles Stephens. In this office he continued till his death.

Robert Stephens (3), son of Robert Stephens (2), was educated by the poet and Abbé Desportes, who inspired him with a love for poetry. He did not commence printing till 1606. He distinguished himself also by his Latin, Greek, and French verses, and by a French translation of the first two books of Aristotle's 'Rhetoric,' which was printed in 1630, 8vo. In his publications he generally added to his name the letters R. F. R. N., that is, Roberti Filius, Roberti Nepos, to distinguish himself from his father and grandfather. He printed a great number of books.

Paul Stephens, a son of Henry Stephens (2), by his second wife, was born at Geneva in 1566. He received his early education at home, and was then sent out by his father to visit the principal towns of Europe, and the distinguished scholars with whom his father was acquainted. Lipsius, whom he visited at Leyden, was much pleased with him. On his return to Geneva he assisted his father in printing and editing. He afterwards made several other journeys, partly perhaps in connection with the business of his father. In 1594 he spent some time in London.

After the death of his father, Paul was placed at the head of his father's printing establishment (1599), which he conducted with great energy. He reprinted a number of classical authors which had been edited by his father, and were then out of print, such as Virgil, Horace, the letters of Pliny, and the Latin panegyrists and others. The two works which do him most credit are his Sophocles and Euripides. In 1619 he printed a folio edition of Herodotus, founded upon that of his father, with a Latin translation and notes by Sylburg.

Francis Stephens (2), son of Robert Stephens (1), and an elder brother of Henry Stephens (2), followed his father to Geneva, and is said to have been a good Greek and Latin scholar. After the death of his father he established at Geneva a printing-office of his own, which he conducted from 1562 to 1582, with an interruption however of nearly ten years. The first work, and almost the only one that he printed on his own account, was Calvin's 'Commentaries on the Psalms,' 1563, folio. His last publication was Amyot's French translation of the 'Moralia' of Plutarch, 1581–2, 2 vols. folio.

Anthony Stephens, son of Paul Stephens, was born at Geneva in 1592. He studied at Lyon, and afterwards finished his education at Paris, where he abjured Protestantism before Cardinal du Perron. In 1612 he obtained letters patent of naturalisation in France. The earliest work which he printed belongs to the year 1613, and henceforth he conducted his establishment with an activity worthy of his great ancestors until the year 1664. He was also honoured with the title of royal printer, through the influence of Cardinal Perron, and he received a pension of 600 francs, but the time when he first received it is uncertain. The pension was stopped when Perron died, and Anthony after this was several times in great pecuniary difficulties. Among his numerous publications, which comprise all the works of Perron, there are several valuable editions of ancient authors, such as Casaubon's edition of Strabo, 1620; of Plutarch's Works, with Xylander's translation, 1624, 2 vols. folio; Leunclavius's edition of Xenophon, 1625; Aristotle's Works, 1629, 2 vols. folio.

For many years after the death of his patron, Anthony was supported by his son Henry, who, from the year 1646 had a printing-office of his own, where, among other works, Montaigne's 'Essais' were printed. When this son died in 1661, Anthony was deprived of his only support: he became infirm, and at last lost his sight. In this state he dragged on a wretched existence until the year 1674, when he died in the Hôtel-Dieu at Paris, at the age of 82. He had six children, all of whom died before him.

Besides the members of the Stephens family, whom we have mentioned above, there are two more, who however were never engaged in printing. The one is Henry Stephens, a son of Robert Stephens (2), who was treasurer of the royal palaces; the other likewise called Henry, and a son of the former, acquired some reputation as a poet, and also wrote some other works in French.

STEPNEY. [MIDDLESEX.]

STEPNEY, GEORGE, descended from an ancient family in Pembrokeshire, was born in Westminster, in 1663. In 1676 he was sent to Westminster School, whence he removed in 1683 to Trinity College, Cambridge, where he distinguished himself in 1683 by a Latin ode on the marriage of the Princess Anne to Prince George of Denmark. He took the degree of M.A. in 1689. In 1692 he was sent as envoy to the elector of

Brandenburg; in 1693, to the emperor of Germany; in 1694, to the elector of Saxony. In 1695 he published a poem, dedicated to the memory of Queen Mary; in 1696 he went as envoy to the electors of Mentz and Cologne, and to the congress at Frankfort; in 1698 to Brandenburg, in 1699 to the king of Poland, in 1701 to the Emperor, and in 1706 to the States-General. He was made one of the Commissioners of Trade in 1697. He died at Chelsea in 1707, and was buried in Westminster Abbey.

Stepney's poems are few, and of little value. He was one of the 'eminent hands' who were united with Dryden in the translation of Juvenal in 1693.

STEPPES. [PLAINS.]

STERCU'LIA, a genus of plants which gives its name to the natural family of *Sterculiaceæ*, which sometimes forms a section of the family of *Byttneriaceæ*. The species consist of various-sized trees with soft timber, which are found in the tropical parts of the world, with simple or compound leaves and axillary panicles or racemes of flowers. Many of them are of considerable use in the countries where they are indigenous. Like the family to which they belong, several species are mucilaginous; and others yield fibre, which, from its tenacity, is made into ropes. Some yield a gummy exudation resembling tragacanth, and which is sometimes substituted for it. Thus the gum called tragacanth, which is sometimes imported from Sierra Leone, is said by Dr. Lindley to be yielded by a species which he calls *S. Tragacantha*, the *S. pubescens* of others. *S. guttata* yields a bark, from which the natives of Malabar prepare flax-like fibres, which are woven into a sort of cloth. *S. acuminata* is a native of the tropical parts of the western coast of Africa, where its seeds are everywhere known by the name of cola, and are mentioned by most travellers.

STERCULIA'CEÆ, a natural order of plants belonging to the syncarpous group of polypetalous Exogens. The order includes several groups of plants, which have by many writers been made to form distinct orders. *Sterculiaceæ* are most nearly allied to *Malvaceæ*. They are natives of India, Australia, the Cape of Good Hope, and South America, with the West Indies. Most of its subdivisions have however a very definite geographical range.

The subdivisions of *Sterculiaceæ* are *Helicterieæ*, *Sterculieæ*, *Bombaceæ*, *Dombeyeæ*, *Byttnerieæ*, *Lasiopetaleæ*, and *Hermannieæ*.

STEREOGRAPHIC. This word, which is derived from στερεὸς, 'solid,' and γράφειν, 'to draw,' and which therefore ought to be applied to every method of representing a solid in a plane, has nevertheless a limited technical sense, being applied to that projection of a sphere in which the eye is at a point in the sphere, and the plane of projection is the great circle of which the eye is at the pole, or a plane parallel to it. This mode of projection was known to Hipparchus, and was first described in the work on the planisphere attributed to Ptolemæus.

The stereographic projection has two remarkable properties. The first is, that all circles are projected either into straight lines or circles. Those which pass through the eye are of course projected into straight lines; in every other case the projection is the subcontrary section of a cone, which has its vertex at the eye, and the circle to be projected for its base; consequently the projection is a circle. As much of the circle as lies below the plane of projection (the eye being considered as above it) is projected inside the great circle on which the projection is made; and all the rest outside; when this projection is employed in maps, it is usual to place all the part of the globe to be projected below the plane of projection.

The second property is, that the angle made by two circles which meet on the globe, is equal to the angle made, at the point of meeting, by the two circles which are the projections of those circles, the angle made by two intersecting circles on the globe being always that made by their tangents.

The first property was known to Hipparchus and Ptolemæus, the second was first given by Halley, and is attributed by him to Demoivre or Hook.

STEREOTYPE. Stereotype Printing is printing from cast plates of type-metal instead of moveable letters or types, and derives its name from the Greek στερεὸς, firm or fixed, and τύπος, a figure or type.

William Ged, a goldsmith of Edinburgh, about 1725, was the first person who made stereotype plates obtained by casts from types; but his method fell into disuse. About the year 1780, Mr. Tilloch, editor of the 'Philosophical Magazine,' also conceived the possibility of casting whole pages, he being, at that time, unacquainted with the prior experiments of Ged. He communicated his idea to Foulis, printer to the university of Glasgow; and they jointly produced several works, some of which were circulated without any intimation of the process by which they were printed. Satisfactory as they were, they did not immediately lead to the adoption of stereotype printing.

Towards the latter end of the 18th century, many projects were brought forward in France for multiplying engraved blocks or forms of type by processes more or less resembling that of stereotyping, under the names of polytype, stereotype, &c. In some of these the form was imitated by striking upon a mass of soft metal in a state intermediate between perfect fusion and perfect solidity, on the principle of the process now practised in France under the name of *clichage*. Some of the early experiments of Senefelder, the inventor of lithography, were directed to the discovery of a means of stereotyping by which he might be enabled to print his own works with a very small stock of type. He formed a composition of clay, fine sand, flour, and pulverised charcoal, mixed with a little water, and kneaded as stiff as possible; and with this paste he made a mould from a page of types, which became, in a quarter of an hour, so hard that he could take a very perfect cast from it in melted sealing-wax, by means of a hand-press. He states that, by mixing a little pulverised plaster of Paris with the sealing-wax, the stereotype plates thus produced were

much harder than the common type-metal of lead and antimony. Professor Wilson, of Glasgow, in 1797, devised a method of multiplying engraved blocks or plates by stereotype or rather polytype impressions in glass or enamel, which, it was anticipated, would prove very durable, and might be applied with advantage to the prevention of forgery.

The revival and introduction into common use of the stereotyping process is, in a great measure, due to the exertions of the late Earl Stanhope, about the commencement of the present century. The earl assisted with his counsel and purse many of those who were at that time engaged on the subject; and stereotype printing became firmly established about 1809.

In setting up a form intended for stereotyping from, the *spaces*, or short pieces of metal by which the words are separated from each other, and the *quadrats*, or larger spaces by which blank lines are filled up, are cast higher than usual. The types are set up and formed into pages in the usual manner, with the illustrative wood-cuts, if there be any; but, instead of these pages being arranged into a form of sufficient size to print a whole sheet, each page, if large, or every two or four pages, if small, is separately locked up in a small frame or *chase*; the pages being surrounded by fillets of wood or metal, which serve in the cast to form a border for attaching the plate to its mount. The face of the types is then moistened with oil, to prevent the mould from adhering to them. A brass frame, rather larger than the page, is laid upon the chase, in order to retain the plaster while in a fluid state, and to regulate the thickness of the mould. The plaster is then poured on the types, and it soon sets into a solid mass, which must be removed from the types with great care, and trimmed on the edges with a knife. The plaster moulds are, in the next place, baked in an oven heated to about 400° Fahrenheit, until they are thoroughly dry and hard. They are placed upright in a rack, and are usually dried in about two hours. Great care is required in this process, especially when the moulds are large, to prevent them from warping.

After being baked, the mould is placed, with its face downwards, upon a smooth plate of iron, called a *floating-plate*, which lies at the bottom of a cast-iron box rather larger than the mould. The box is then covered in by a lid, the under surface of which is made perfectly flat, and which has the corners cut off, to allow the melted metal to enter the box. The cover is firmly held down by a screw, which is attached to an apparatus by which the box is suspended from a crane. It should be observed that the casting-box and plate are heated to the same temperature as the mould, before it is inserted. The box is then swung by the crane over the metal-pit, which is an open iron vessel containing a large quantity of melted metal, resembling in its composition that used for casting types; and it is lowered into the metal in a nearly horizontal position, being a very little inclined, to facilitate the escape of air from the mould and box. The melted metal runs in at the corners of the box; and, by its greater specific gravity, floats up the plate with the mould, forcing the latter tightly against the lid of the box. By this contrivance the metal is forced, by hydrostatic pressure, into every part of the mould, in the margin of which notches are cut to allow free passage for the metal between it and the floating-plate. After remaining immersed in the metal for about ten minutes, the box is gently raised, and removed by the crane to a trough in which its lower part is rapidly cooled by contact with cold water. While the box is cooling, the caster pours in a little metal at the corners, to fill the space left by the contraction of the metal, and so to keep up the necessary pressure upon the cast. When cold, the contents of the box are removed in a mass, from which the superfluous metal is broken off by blows from a mallet. The plaster-mould is then broken away from the cast, the face of which is a fac-simile of the types and engravings from which the mould was taken. As the mould is destroyed by this process, it is necessary, when several stereotype plates of the same page are required, to take a distinct plaster mould for each.

The above is the mode of casting usually practised in England; but various modifications of the processes have been brought into use in Edinburgh and elsewhere.

Stereotype-plates need careful examination and *picking*, to remove the imperfections in the casting. Small hollows, such as the loops of an a, an e, or an o, are liable to be filled up with metal, owing to blebs of air in the mould, and the fine white lines in wood-engravings are sometimes filled up. Such matters should be corrected by the picker, who should also cut down, with suitable tools, such blank spaces as might be liable to soil in printing. Before printing also, defective letters or words which cannot be corrected by the picker should be cut away, and types inserted in their place. These types are soldered into holes drilled through the plate; their stems being sawn off flush with the back.

Although the plates are cast of as equal a thickness as possible, they require, before printing from, to be accurately flattened at the back by means of a peculiar kind of lathe, in which a steel cutter, or *knife*, mounted in a slide-rest, shaves off the metal from the back of the plate in concentric circles, until it is made perfectly even. They are then mounted upon blocks of wood or metal, to raise them to the same height as common types. The tendency of wood to warp when exposed to changes of temperature, or to occasional wetting, has led to many projects for mounting stereotype-plates upon blocks of cement, or upon metallic mounts which might be applicable to plates of various sizes. When wooden blocks are used, the plates are usually secured to them by clips at the edges, and sometimes by screws.

The process of stereotyping is one of the most important means by which the production of cheap books has been facilitated of late years. For a work of limited and temporary demand it is unnecessary; but where the demand is very great, and likely to last for several years, it is all-important, since it enables the publisher to keep up the supply without the expense of having a

very large edition printed at once. In most cases where the demand is uncertain, and in almost all where the demand is sure to be large, it is desirable to resort to stereotyping, because, although it increases the first cost of production, it enables the publisher to avoid, on the one hand, the risk of printing a great number of copies which may prove unsaleable, and, on the other, the outlay necessary for the recomposition of the types, in case the demand should exceed the number of copies first printed.

It has often been urged as an objection to stereotype printing that it tends to perpetuate errors; but the fallacy of such a statement may be easily shown. In re-composition new typographical errors are pretty sure to arise, while the expurgation of old ones is by no means certain; but in stereotype plates the occurrence of new errors (excepting by the breaking off of a letter or figure) is impossible, and original errors may be altered whenever they are discovered. Such alterations are not necessarily confined to the insertion of a letter or a word; for whole sentences and paragraphs may be altered in like way, provided that the new matter be made the same in extent as that which is cut away. Hence a stereotyped work may be gradually rendered almost immaculate; and an error which would otherwise have run through the whole edition, may be corrected when only a few hundred copies have been circulated.

STERLING, a word applied to all lawful money of Great Britain. In Ruding's work on 'Coinage,' vol. i., p. 13, 4to. edit., the various supposed derivations of the word are given. Ruding says, 'its origin and derivation are still unsettled;' but he inclines to attribute it to an abbreviation of Esterlings, people of the north-east of Europe, some of whom were employed in the 12th century in regulating the coinage of England. The word was not in use before the Conquest, though some have given it a Saxon derivation.

STERNBERG. [MORAVIA.]

STERNBE'RGIA, the generic name for a singular group of fossil plants, supposed to be of the Palm tribe by Brongniart. Mr. Dawes has compared it to the interior of some tree stems in which the pith is transversely divided by diaphragms. It has been also named *Artisia* by Presl. It occurs in the coal formation.

STERNE, LAURENCE, was the great-grandson of Dr. Richard Sterne, who died archbishop of York in 1683. His father, Roger Sterne, lieutenant in Handaside's regiment, was killed in 1727 in the defence of Gibraltar. Laurence Sterne was born Nov. 24, 1713, at Clonmel in Ireland. At the age of ten, after continual change of residence caused by the movements of his father's regiment, he was sent over to England, and put to school, near Halifax, 'with an able master,' says he, 'with whom I stayed some time, till, by God's care of me, my cousin Sterne of Elvington became a father to me, and sent me to the university.' He was admitted of Jesus College, Cambridge, July 6, 1733; took the degree of B.A. in Jan. 1736; and that of M.A. at the commencement of 1740. On leaving the university he took orders, and his uncle, the Rev. Jaques Sterne, LL.D., a younger brother of his father's, procured him the living of Sutton, in Yorkshire. It was in the city of York that he met with the lady whom he married in 1741. She brought him some fortune, but probably of no great amount. Sterne's uncle now procured him a prebend in York cathedral. Soon after his marriage, a friend of his wife's presented him with the living of Stillington, also in Yorkshire; and he tells us he remained near twenty years at Sutton doing duty at both places. During all this time, his only acknowledged publications were two sermons: the first, entitled 'The Case of Elijah and the Widow of Zarephath considered,' in 1747; the second, entitled 'The Abuses of Conscience,' in 1750. This latter is the same which he afterwards introduced in the second volume of his 'Tristram Shandy' as a Sermon of Yorick's.

The first two volumes of 'Tristram Shandy' were originally published at York, towards the end of 1759, and were reprinted at London early in 1760. Although anonymous, the work seems to have been known to be Sterne's from the first; and it raised him at once from obscurity to universal notoriety and high literary fame. This and his subsequent publications—two volumes of Sermons in 1760, vols. 3 and 4 of 'Tristram Shandy' in 1761, vols. 5 and 6 in 1762, vols. 7 and 8 in 1765, two more vols. of Sermons in 1766, the 9th vol. of 'Tristram Shandy' in 1767, and the 'Sentimental Journey' in 1768—probably also brought him a good deal of money; and his circumstances were further improved by his being presented by Lord Falconbridge, in 1760, with the curacy of Coxwold, about 10 miles from Sutton, which he calls 'a sweet retirement, in comparison of Sutton.' In 1760 he took a house at York for his wife and daughter; but his own time he seems from this date to have spent mostly either in London or on the Continent. In 1762 he went to France, whither he was soon after followed by his wife and daughter. Leaving them both in that country, he seems to have in the first instance returned to England, whence, in 1764, he proceeded to Italy, with a view to the recovery of his health, now greatly impaired. He returned to England in the earlier part of 1767, and having persuaded his wife to come over to him with their daughter, he remained at York till he had written all that we have of his 'Sentimental Journey.' He lived merely to see the work brought out; having died, at his lodgings in Bond Street, March 18, 1768 (not the 13th of September, as is stated on his monument erected some years after in the burying-ground of St. George's, Hanover Square, where he was interred). In 1775, after her mother's death, Sterne's daughter published three small volumes of his Letters to his Friends, along with the short autobiographical memoir from which many of the above facts have been taken. The same year there appeared, under the title of 'Letters to Eliza,' ten letters addressed by Sterne, in March and April, 1767, to an East India lady, who is described by the editor as a 'Mrs. Elizabeth Draper, wife of Daniel Draper, Esq., counsellor at Bombay, and at present chief of the factory at Surat.' With the exception of three

more volumes of sermons, and one or two fragments, the only other remains of Sterne that have been printed consist of a second collection of letters, in one volume, which also appeared in 1775; with the addition of a piece of humorous satire entitled 'The History of a Watchcoat,' which however had been published separately about seven years before.

Sterne has been accused of plagiarism from Rabelais, Burton, and others; but whatever he may have borrowed from them, and whatever he may have in common with them, he has much more which differs from them, and is wholly his own.

STERNHOLD, THOMAS, was a native of Hampshire. The date of his birth is not known. He was educated at Oxford. He was groom of the robes to Henry VIII., and retained the same office under Edward VI., in whose reign he died, Aug. 1549. Sternhold's only claim to distinction is, that he was the principal author of the first English metrical version of the Psalms attached to the Book of Common Prayer. He had undertaken to versify the whole of the Psalms, but completed only fifty-one; the rest were translated by John Hopkins and others. He was also the author of 'Certain Chapters of the Proverbs of Solomon, drawen into Metre,' London, 1549, 8vo. The complete version of the Psalms by Sternhold and Hopkins was not published till 1562, when it was first annexed to the Book of Common Prayer.

STERNOPTYX, a genus of small fishes belonging to the order *Salmonidæ*, though very different in aspect from salmons or trouts. They have very elevated and much compressed bodies. They live in the warmer regions of the Atlantic Ocean.

STERNUM. [SKELETON.]

STERNUTORIES, called also *Ptarmics*, agents which cause sneezing. The most familiar are snuffs of different kinds, many of which cause likewise a flow of the natural secretion from the nose, when they are termed ERRHINES.

STESICHORUS, one of the earliest and most celebrated lyric poets of ancient Greece. He was a native of Himera in Sicily, and probably born about B.C. 643. He is said to have lived to the age of eighty-three. His original name, according to Suidas, was Tisias, and he assumed the name of Stesichorus, because he trained and directed the solemn choruses of the religious festivals. He gave to the choral songs the artistic form which Pindar afterwards brought to perfection. The subjects of his poetry were from the mythical and heroic ages of Greece.

Besides his choruses Stesichorus composed pæans and hymns which were of a more purely lyrical character. He is also the first Greek poet who wrote erotic poems containing celebrated love stories. The bucolic poetry of Sicily was also raised by him from a rude and unpolished state to classical perfection.

Stesichorus is as a lyric poet totally different from what we usually understand by this term, for his works did not contain any effusions of his own feelings and thoughts; the subjects were stories belonging to past ages, and taken either from the early traditions of Greece, or from the legends current among the Sicilian peasantry.

After his death the Himeræans erected a statue, which represented him as a man weighed down by old age, with a book in his hand. (Cic. 'Verr.,' ii. 35.) Cátana disputed with Himera the honour of possessing the tomb of Stesichorus, and magnificent monuments in honour of him were erected in both places.

The best collection of the Fragments of Stesichorus is by Kleine, published at Berlin, 1828, 8vo. They are also contained in Gaisford's 'Poet. Græc. Minor.;' and in Bergk's 'Poet. Lyrici Græc.'

STETHOSCOPE. [AUSCULTATION.]

STETTIN, one of the three governments into which the Prussian province of Pomerania is divided, is bounded N. by the Baltic and the government of Stralsund, E. by the government of Köslin, S. by Brandenburg, and W. by Mecklenburg. The area is 5012 square miles, and the population in 1847 was 547,952. The government, which has a very level surface, is almost entirely included in the basin of the Oder, which river empties itself into a wide salt lake called the Stettiner-Haff. The Haff communicates with the Baltic by three narrow channels; the principal of these is the Swine, which runs between the two islands of *Usedom* and *Wollin*, and is used by vessels making for Stettin; the other channels are the Divernow to the east of Wollin Island, and the Peene to the west of Usedom. The area of these islands and that of the Haff also are included in the surface measure given above. To the north of the islands lies the harbour of Swinemünde, one of the most important in Prussia. The chief products are named and the face of the country described under POMERANIA. Agriculture and the Baltic fisheries are the chief occupations of the inhabitants. The manufacturing industry, which is of no great importance, is almost entirely confined to the towns. Stettin, the capital of the government, is connected by railways with Berlin and Posen.

Stettin, the capital of Pomerania and of the government of Stettin, a flourishing commercial and strongly-fortified town, is situated in 53° 25′ 36″ N. lat., 14° 44′ 30″ E. long., on an eminence on the left bank of the Oder, at a distance of 83 miles by railway N.E. from Berlin, and has 45,000 inhabitants, including the garrison. The Oder divides at Stettin into four arms, which are crossed by wooden bridges connecting the town with several suburbs, some of which are inclosed by the fortifications. The proper citadel is called Fort Prussia, besides which there are forts William and Leopold. The town, which is entered by five principal gates and eight posterns, has several squares, and contains all the principal government-offices of the province. Of the public buildings, the most remarkable are—the Schloss, formerly the residence of the dukes of Pomerania, the Schloss-Kirche, the church of St. Peter and St. Paul, and that of St. Jacobi, the government-house, the arsenal, the house of the provincial estates, the great barracks, the three hospitals, and the theatre. Besides the gymnasium, to which an observatory is attached, there are a

medical college and several educational establishments and charitable institutions. The manufactures are woollens, linen, cotton, leather, hats, stockings, ribands, sail-cloth, ship anchors, soap, and tobacco. Boats and ships are built. The trade of Stettin is very considerable, it being the chief port for the manufactures and produce of Silesia, and for the importation of all kinds of foreign goods, especially colonial produce, for the supply of Silesia, Berlin, and other places. Large vessels anchor at Swinemünde, and their cargoes are conveyed to Stettin in lighters, the Haff being too shallow to admit vessels of deep draught. The number of sea-going vessels that entered the harbour of Swinemünde in 1849 was 1239, besides 469 coasters and steamers. Foreign consuls reside in Stettin.

Stargard or *New Stargard*, situated 21 miles by railway E.S.E. from Stettin, in 53° 19′ N. lat., 15° 5′ E. long., on the left bank of the navigable river Ihna, a feeder of the Oder, has 11,500 inhabitants, including the suburbs. It is one of the best towns in Pomerania; is surrounded with a wall, and has three gates and three posterns. The chief manufactures are woollen cloth, linen, hats, stockings, leather, soap, tobacco, pottery, beer, and spirits. There are in the town four churches, a gymnasium, and several schools and charitable institutions. Several fairs are held annually for the sale of horses and cattle, wool, linen, &c. The town has a good export trade in corn and the other productions of the country.

Anklam, 45 miles N.W. from Stettin, on the Peene, has a considerable commerce in corn and timber; the population is about 9500. The manufactures include woollen stuffs, linen, hosiery, tobacco, and leather. *Damm*, 4 miles E. from Stettin, on the Stettin-Posen railroad, is a strongly-fortified town, with about 3000 inhabitants. *Demmin*, 72 miles N.W. from Stettin, at the junction of the Tollense and the Trebel with the Peene, is a manufacturing town of 7000 inhabitants, who carry on a considerable commerce in firewood, timber, corn, glass, malt, &c., by the Peene, which is navigable for small craft. Leather, linen, gloves, woollen cloth, and tobacco are its chief industrial products. *Golnow*, a walled town with 3600 inhabitants, copper foundries, and cloth factories, stands on the Ihna 18 miles N.E. from Stettin. *Greifenhagen*, S. of Stettin, on the right bank of the Oder, has a population of 5000, who manufacture broad-cloth and trade in corn. *Passewalk*, a walled town on the right bank of the Uker, 21 miles W. of Stettin, has several breweries, a considerable trade in cattle and wool, and a population of 5500. *Swinemünde*, a seaport town of about 4000 inhabitants, situated on the island of Usedom, at the entrance of the Swine channel of the Oder into the Baltic, has sea baths, a custom-house, a handsome church, ship-building yards, and a considerable trade. By means of extensive dams constructed in recent times, the harbour of Swinemünde, which is the outport of Stettin, has been made accessible to the largest ships. Steamers ply regularly to Stettin, the isle of Rugen, and other places along the coast. *Treptow*, situated on the left bank of the Rega, 57 miles N.N.E. from Stettin, has spirit distilleries, cloth factories, and 5000 inhabitants. The Rega is navigable for small craft from this town to its mouth in the Baltic.

STEUART, SIR JAMES, born at Edinburgh, Oct. 21, 1712, was the only son of Sir James Steuart, solicitor-general for Scotland, under Queen Anne and George I. After being admitted to the Scotch bar at the age of 24, he proceeded to the Continent, and at Rome was introduced to the young Pretender. He was called to Edinburgh by the illness of his wife, at the period of the rebellion of 1745, where his intercourse with Charles Edward was resumed. After the battle of Culloden he found it prudent to retire to the Continent, where he remained for the next seventeen years. In 1763 he was permitted to return to his native country; but it was not until 1771 that he received a free pardon. Having settled at Coltness, the seat of his family in the county of Lanark, he finished the most important of his works, 'An Inquiry into the Principles of Political Economy,' published in 1767. He wrote also on the coinage of Bengal; on a plan of uniform weights and measures; and while on the Continent published in French a 'Vindication of Sir Isaac Newton's Chronology.' He was also the author of several metaphysical disquisitions, the two principal of which were on Beattie's 'Essay on Truth,' and Mirabaud's 'System of Nature.' He died in Nov., 1780, aged 67.

STEVENS, GEORGE ALEXANDER, was born in London, and at an early age became a strolling player. In 1751 he had an attack of illness, and published a poem entitled 'Religion, or the Libertine Repentant.' In 1752 he obtained an engagement at one of the Dublin theatres, where he produced a burlesque tragedy, called 'Distress upon Distress.' In 1753 he was engaged for Covent Garden Theatre, and came to London. Stevens was not a good actor, but he wrote songs which were admired. He led a life of dissipation, was generally necessitous, and always extravagant. In 1760 he published a novel, 'The History of Tom Fool,' 2 vols. 12mo.

The work by which Stevens is chiefly known is the 'Lecture on Heads,' which he began to perform about 1763, in the principal towns of England and Scotland, with great success. He afterwards went to North America, where he was not less successful than he had been in England. After a stay of about two years he returned, and then proceeded to Ireland. In a few years he realised about 10,000*l*. In 1766 he produced a 'Supplement; being a New Lecture upon Heads.' It was only performed six nights. His other productions are of little importance. He died Sept. 6, 1784. After Stevens's death was published, in 1788, 'The Adventures of a Speculist; compiled from the Papers of G. A. Stevens: with his Life, a Preface, and Notes, by the Editor.'

His songs were collected, and published at Oxford in 1772. The only one which retains any popularity is 'The Storm.'

STEVENS, RICHARD JAMES SAMUEL, was born in London, about 1753, and educated

in St. Paul's cathedral. His first appointment was as organist to the Temple church. In 1795 he became organist of the Charterhouse; and in 1801 was elected professor of music to Gresham College. In 1782 he gained the prize-medal from the Catch Club for a serious glee, and another in 1786 for a cheerful glee. These, with many more compositions of the same class, particularly his glee, from Ossian, 'Some of my heroes are low,' speedily obtained the stamp of public approbation. Mr. Stevens published three sets of glees and some songs, and edited a useful collection of anthems, &c. He died in 1837.

STEVIN, SIMON, was born about the middle of the 16th century at Bruges. He went to reside in Holland, where he obtained the title of mathematician to Prince Maurice of Nassau, and he was made civil engineer to the States, the charge of constructing and repairing the dykes being confided to him. It is to be regretted that no other particulars concerning his life have been preserved. Even the year of his death is unknown.

He wrote a treatise on arithmetic, which was printed at Antwerp in 1585; and in the same year he published a collection of geometrical problems in five books. He appears to have studied algebra with great attention, and he made in that branch of science several improvements.

In 1586 Stevin published in quarto, and in the Dutch language, his tract on Statics and Hydrostatics; and in the same year he published, also in Dutch, his 'New System of Fortification.' In 1589 he brought out a tract entitled 'De Motu Cœli;' and ten years afterwards, in Dutch, a treatise on navigation, which was translated into Latin by Grotius, and published at Leyden in 1624.

The work on Statics contains a simplification of the demonstration of Archimedes, that weights at the two ends of a lever are in equilibrio when they are inversely proportional to the lengths of the arms from whose extremities they are suspended. In order to exhibit the conditions under which a body is in equilibrio on an inclined plane, Stevin imagines a string, on which are placed a number of equal weights, at equal distances from one another, to be laid across the edge and on the sides of a triangular prism whose base is horizontal; the two parts of the string of weights extending to equal distances below that base. He concludes that the string so placed would be at rest on the two planes, and he infers that the same power is required to support different bodies on single inclined planes of equal heights, when the weights of the bodies are proportional to the lengths of the planes. From this theory, also, Stevin discovered that an equilibrium between three forces acting at one point in a body, takes place when the forces are parallel and proportional to the three sides of a triangle. His demonstration however extends only to the case in which the directions of two of the forces are at right angles to one another.

STEWARD, LORD HIGH, OF ENGLAND, one of the ancient great officers of state. Under the Norman kings and the early kings of the Plantagenet line it seems to have been an hereditary office. It was merged in the regal dignity in the person of Henry IV.; and since that time the title and office have only been reserved for particular occasions; and the office ceases when the business which required it is ended; and this occasion has usually been when a person was to be tried before the House of Peers. On this occasion there is a lord high steward created, who presides, and when the proceedings are closed, breaks his wand, and dissolves the court; but if the trial takes place during the session of parliament, though a lord steward is appointed, it is not considered as his court, for he has no judicial functions, and only votes with the rest as a peer, although he presides.

STEWART, MATTHEW, D.D., was born at Rothsay, in the Isle of Bute, in 1717. Having received the best education which a grammar-school afforded, he prosecuted his studies in philosophy and theology at the university of Glasgow.

On going to reside in Edinburgh, Mr. Stewart attended the lectures of Maclaurin. In 1747 however, on the death of that mathematician, he was elected to succeed him; and he held the post of mathematical professor in the university till 1772, when his health began to decline. In 1775 he retired to an estate in Ayrshire, where he spent nearly all the rest of his life in cultivating science as an amusement. He was elected a Fellow of the Royal Society in 1764; and he died in 1785, being then 68 years of age.

The first efforts of Dr. Stewart in science were to extend the subject of what is called the 'locus ad quatuor rectas' to the powers of any number of perpendiculars drawn to an equal number of lines; and, while engaged in this pursuit, he discovered most of those propositions which, in 1746, he published under the title of 'Geometrical Theorems.' In the first volume of the 'Essays of the Philosophical Society of Edinburgh,' there is a paper by Stewart containing some propositions founded on a theorem in the fourth book of Pappus; and in the second volume of the same work he gave a solution of 'Kepler's Problem.' In 1761 he published his 'Four Tracts, Physical and Mathematical;' and in the following year he published a series of geometrical propositions, entitled 'Propositiones More Veterum demonstratæ,' which are investigated analytically, and afterwards demonstrated by synthetical processes. His last work was an 'Essay on the Sun's Distance;' and this problem he endeavoured to treat according to the method of the ancients, but the subject is too intricate to admit of their analysis being applied to it, though the work exhibits all the ingenuity which might be expected from the learned author.

STEWART, DUGALD, the son of Dr. Matthew Stewart, was born in Edinburgh, Nov. 22, 1753. He was educated at the high school of Edinburgh. In the winter of 1772 he attended the course of lectures delivered by Dr. Reid at Glasgow; his love for metaphysical speculation was roused, and he wrote an 'Essay on Dreaming,' which he afterwards incorporated in his 'Elements of the Philosophy of the Human Mind.' He was then in his 19th year. Having

completed his studies at Glasgow, he assumed the charge of the mathematical classes hitherto taught by his father in the university of Edinburgh, and on coming of age he was appointed mathematical professor.

In 1778, when Dr. Ferguson, then professor of moral philosophy at Edinburgh, was sent as secretary to the commissioners to conclude peace with North America, Dugald Stewart was called upon to fill his place during his absence; and on the retirement of Dr. Ferguson, in 1785, he was appointed his successor. He became popular, even before he had published anything, and, as Sir James Mackintosh truly remarks, 'without derogation from his writings it may be said that his disciples were among his best works.' His first work was the 'Elements of the Philosophy of the Human Mind,' the first volume of which appeared in 1792. In 1793 Dugald Stewart published his 'Outlines of Moral Philosophy,' a text-book for his pupils; and the 'Life of Adam Smith,' which appeared in the 'Transactions' of the Royal Society of Edinburgh; and which was followed by the 'Life of Dr. Robertson' in 1796, and the 'Life of Dr. Reid' in 1802. His activity was unceasing; and in 1800 he added a series of 'Lectures on Political Economy' to his heavy professional duties, but they were not continued. In the winter of 1808-9, from grief at the loss of his younger son, which brought on a severe indisposition, he was obliged to have a deputy to discharge his duties. In the following session he resigned altogether. The fruits of his retirement were not slow in manifesting themselves: in 1810 appeared his first volume of 'Philosophical Essays.' In the preface to this work he says, 'The state of my health having interrupted, for many months past, the continuation of my work on the human mind, I was induced to attempt, in the mean time, the easier task of preparing for the press a volume of Essays.' Yet it is in this work, which he considered the 'easier task,' that he has best proved his claim to the title of a metaphysician. In 1814 the second volume of his 'Elements of the Philosophy of the Human Mind' appeared; but was not so well received, and never, we believe, reached a second edition. In 1815 appeared his celebrated Preliminary Dissertation to the Supplement of the 'Encyclopædia Britannica,' entitled 'A General View of the Progress of Metaphysical, Ethical, and Political Science since the Revival of Letters;' a work for which his discursive reading well fitted him. In spite of the desultory and careless character of this discourse, its want of unity and any comprehensive principle, Sir James Mackintosh declares it to be 'the most splendid of Mr. Stewart's works.'

In 1821 the second part of his 'Discourse' was published, which attracted as much attention as the former, and more hostility, because it was principally occupied with an attack on Locke and his school. The following year he suffered from palsy, which interrupted his labours till 1827, when he published the third volume of his 'Elements.' In 1828, a few weeks before his death, he published his 'View of the Active and Moral Powers,' by far the least exceptionable of his works. He died June 11, 1828, and was buried in the Canongate Churchyard, Edinburgh.

STEWARTON. [Ayrshire.]

STEYER, a manufacturing town in Upper Austria, stands in 48° 4′ N. lat., 14° 20′ E. long., 90 miles W. by S. from Vienna, and has 10,100 inhabitants. The town, which is entered by five gates, is built in the fork between the Enns and the Steyer, which rivers are crossed by bridges leading to the two principal suburbs Enns-dorf and Steyer-dorf. It is of considerable extent, neat, and pretty well built; but many of the streets are narrow and crooked. There are three squares, one of which, surrounded by houses built in the Italian style with flat roofs, galleries, and slates, is very large and ornamented with two fountains. The castle of Steyer, the family seat of Count Lamberg, on a hill on the right bank of the Steyer, the Jesuit College on a height above the Steyer-dorf suburb, the Dominican church in the great square, the ancient parish church with its lofty tower commanding a fine view of the town and the adjacent country, the old and new town-house, the theatre, the barracks, and the four hospitals are the most remarkable structures in the town. Steyer has woollen and cotton manufactures, but is chiefly famous for its cutlery, fire and side arms, ironmongery, razors, files, &c., in the manufacture of which a very large number of workmen are employed in the town and neighbourhood. The iron and steel manufactures of Steyer are largely exported to Switzerland, Turkey, and the Levant. The superior court of justice for the circle of Traun is held in Steyer, which has also a superior mining court, a normal school, and several other educational establishments.

STEYNING. [Sussex.]

STICKLEBACK, the common English name for certain small fishes, which constitute the genus *Gasterosteus* of Linnæus, a genus arranged by Cuvier with the Mail-Checked Acanthopterygians (*Loricati*), and containing both fresh and salt-water species. These little fishes, the river species of which are common in all our streams, flowing ditches, and ponds, are remarkable for their vivacity, the prompt celerity of their movements, their pugnacity, their voracity, and their brilliancy of colouring. The generic characters are as follow:—'Body without scales, more or less plated on the sides; one dorsal fin, with free spines before it; ventral fin with one strong spine, and no other rays; bones of the pelvis forming a shield, pointed behind; branchiostegous rays three.' (Yarrell.)

Mr. Yarrell enumerates the following British species:—The Rough-Tailed Stickleback (*Gasterosteus trachurus*, Cuvier), found both in fresh and salt water. The Half-Armed Stickleback (*G. semiarmatus*, Cuvier). Locality, fresh and salt water. The Smooth-Tailed Stickleback (*G. leiurus*, Cuvier). Locality, as in preceding. The Short-Spined Stickleback (*G. brachycentrus*, Cuvier). Locality, fresh and salt water, Ireland. The Four-Spined Stickleback (*G. spinulosus*, Jenyns and Yarrell). Locality, fresh water. Diminutive; pugnacious. The Ten-Spined Stickleback (*G. pungitius*, Linnæus). Locality, rivers and creeks near the coast. The Fifteen-Spined Stickleback (*G. spinachia*, Lin-

næus). Locality, the seas around the coasts of our island and the adjacent continent; very rare in fresh waters. Voracious; feeds on the fry of small fishes and minute marine insects, &c.

(Yarrell's *British Fishes*; Jenyns's *Manual of British Vertebrate Animals.*)

STIEGLITZ, CHRISTIAN LUDWIG, was born Dec. 12, 1756, at Leipzig, in which city both his grandfather and father were persons of station. He applied himself to jurisprudence and other studies at the university of his native city, took his bachelor's degree in 1777, and in 1784 that of doctor of laws, on which latter occasion he produced his dissertation 'De Causis cur Jus Feudale Germanicum in Germaniâ neglectum sit.' In the meanwhile he devoted all his leisure to literature and art, and in 1775 made his first essay in poetry. He contributed many pieces to a collection of 'Kriegslieder,' or War Songs, published in 1778; and in 1801 he published 'Wartburg,' a poem in 8 cantos. He also published some tales of romance and chivalry. In 1786 he appeared anonymously as an architectural writer, in his 'Versuch über die Baukunst.' He next contributed some useful articles upon architectural subjects to the 'Neue Bibliothek der Schönen Wissenschaften.' In 1792, the same year in which he was made a member of the Rathscollegium, or Council of Leipzig, he first brought out his 'History of the Architecture of the Ancients' ('Geschichte der Baukunst der Alten'); and immediately afterwards engaged in a work of some extent, namely, his 'Encyclopædia of Civil Architecture,' in 5 vols., the first of which appeared in 1792, the last in 1798. In the interim he brought out a work upon Modern Gardening. His next production was his 'Artistische Blätter' (1800), a collection of papers on Decoration. In 1804 he began to publish, under the title of 'Zeichnungen aus der schönen Baukunst,' a series of engravings, plans, and elevations, intended as select specimens of modern architecture.

Some years elapsed before he again published anything on the subject of architecture, turning in the interim to studies more professedly archæological; the fruits of which were an essay on 'Medals and Collections of Coins,' 1809, a treatise on the 'Pigments employed by the Artists of Antiquity,' 1818, and 'Archæologische Unterhaltungen,' 1820. In 1818 appeared, also, his excellent work on 'Ancient or Mediæval German Architecture' ('Alt-Deutsche Baukunst'); and in 1827, his 'Geschichte der Baukunst,' a valuable compendium of the history of architecture from the very earliest periods, and among all nations. He wrote some other works, besides articles to the principal journals of the day. After having held the office of proconsul in the magistracy of Leipzig, and other appointments connected with the town government, Stieglitz retired from public duties in 1830. He died July 17, 1836.

STIFEL, or STIFE'LIUS, MICHAEL, a celebrated German algebraist of the 16th century, was born at Eslingen, in Saxony, probably in 1509. He was a Lutheran clergyman.

Stifel's first publication was a treatise on algebra, in German; but in 1544, that is, a year before Cardan's rule concerning cubic equations came out, he published at Nürnberg, in Latin, the 'Arithmetica Integra,' which is his principal work. It is divided into three books, of which the first is a treatise on arithmetic; the second, a commentary on Euclid's tenth book; and the third a treatise on algebra. He is said to have been the first who used the signs + and − between quantities, in order to indicate addition and subtraction. Stifel died at Jena in 1567.

STIGLIANO. [BASILICATA.]

STIGLMAYER, JOHANN BAPTIST, was born Oct. 18, 1791, at Fürstenfeldbrück, near Munich, where his father was a blacksmith. As he early manifested ability in drawing, he was placed with a goldsmith at Munich, and also attended the holiday school (Feiertagsschule), in which he obtained the first prize for industry and good conduct, and attracted the notice of M. Leprieur, the director of the Bavarian mint, who procured him admission into the academy in 1810. From this date he pursued the regular course of study requisite for a statuary and sculptor, and at the same time practised seal and medal engraving. He was very successful in 1814 in a medal, with Von Langer, the director of the Academy, on one side, and Moses making the water flow from the rock on the other, for which he was appointed one of the engravers of the mint, and was sent in 1819, at the king's expense, to Italy to complete his studies.

It was in Rome that Stiglmayer's patron, Ludwig, afterwards King of Bavaria (then Crown Prince), first became cognizant of his high abilities, and appears himself to have directed Stiglmayer's attention to metal-founding, in preparation for his own great undertakings already projected. Stiglmayer returned to Munich in 1822, but was at this time employed chiefly as engraver for the mint, and on some works of sculpture for the new Sculpture Gallery or Glyptothek then in progress. In 1824 he commenced preparations for his series of metal castings, which were executed for Ludwig I., king of Bavaria, some of which are the most extensive castings of modern times. Stiglmayer's great activity commenced with the reign of Ludwig I., in 1826, in the foundry established by the king, expressly for his own numerous undertakings in that important branch of art; and he left many, and the most considerable still unfinished, at his death. He was created in 1839 Knight of the Bavarian order of St. Michael. Some of Stiglmayer's works were from his own designs, and some from the designs of Schwanthaler, Von Klenze, and others. Among his works may be mentioned the statue of Schiller at Stuttgardt, the colossal statue of Göthe at Frankfort, and many other statues; the bronze gates of the Glyptothek at Munich, and of the Walhalla near Ratisbon. The colossal figure of Bavaria, nearly 60 feet high, and some other works, were in progress when he died.

Stiglmayer died March 2, 1844, on the day on which the statue of Göthe was cast by his nephew and assistant Ferdinand Müller.

STIGMA, in Botany, one of the three parts

into which the central organs of the flowers called carpels are divided. It is the point or summit of the Style.

The stigma is composed of the same kind of tissue as the interior of the canal of the style, but has a more spongy appearance. Its papillary character also is more evident, and the little swellings on its surface are often called papillæ. These papillæ become less evident as the canal of the style approaches the ovary. The stigma assumes a variety of forms, the distinction of which is often of importance in systematic botany. These forms depend principally upon the tissue of which its surface is composed. Sometimes the papillæ are developed into little hairs, as is seen in the stigma of *Urtica urens*. In other cases it is perfectly smooth, as in *Nymphæaceæ*. In rhubarb it is composed of three flat orbicular disks. In grasses it is in the form of a tufted hairy body like a little brush. In *Mimulus* it has two lips which have the power of contracting, and in *Clarkia* it consists of four broad lobes. In *Orchidaceæ* it has a structure in accordance with the anomalous character of all the parts of the flower in these plants; it consists of an oval humid space which occupies the middle of the central column, and is covered with a thick viscous secretion. In some cases however the stigma is not distinguishable from the style, as in *Asclepias* and *Tupistra*.

The position of the stigma is sometimes anomalous. As it forms the apex or point of the carpellary leaf, it ought always to be alternate with the placentæ, which are formed at the margins of the leaf, but in *Cruciferæ* the stigmata are opposite the placentæ. This may be explained in two ways. Dr. Lindley supposes that in this order there are originally four carpels, two of which being abortive, the stigmata are left opposite the placentæ. Brown on the contrary supposes that the stigmata are originally two-lobed, and that the lobes have united on each side, and thus obtained their abnormal position.

STIGMA'RIA, a genus of fossil plants allied to *Lycopodiaceæ*. Its dichotomous branches lie most frequently under beds of coal, whether *Sigillariæ* stand over these beds or not. It is most abundant in the lower parts of the true coal formation. (Brongniart.)

STILAGINA'CEÆ, a small natural order of plants belonging to the rectembryose group of apetalous Exogens.

The species of this order are all of them natives of the East. Many of the fruits of this order have a pleasant subacid flavour, and are eaten by the natives of the East Indies.

STILA'GO, a genus of trees sometimes united with, at other times separated from, the genus *Antidesma*, belonging to the natural family of *Antidesmeæ*, which by some botanists is called *Stilaginaceæ*. The species are few in number, forming shrubs and moderate-sized trees, which are found in Madagascar and Mauritius, as well as in some of the Indian islands, and in Hindustan, where the species extend even to northern parts. The small fruits of both species are eaten and preserved. The fruits of *Antidesma pubescens*, *Bunias*, and *Diandra*, are eaten by the natives of Hindustan.

STILBA'CEÆ, a small natural order of plants belonging to the nucamentose group of monopetalous Exogens. They are small shrubs, with the habit of a Phylica or a fir. The order consists of only two genera, *Stilbe* and *Campylostachys*, both of which are natives of the Cape of Good Hope. Their properties are not known.

STI'LICHO, FLAVIUS, was of Vandal origin, and his father was a military officer in the reign of Valens. Concerning his early life we know nothing beyond the vague eulogies of Claudian ('De Laud. Stilich.,' i. 42, &c.) He was sent when young by Theodosius on a mission to Persia and he was rewarded for his success in the negociation with the hand of Serena, the emperor's niece. He was promoted from one office to another until he became master-general of all the cavalry and infantry of the Western Empire.

In A.D. 393 Stilicho and Timasius commanded the Roman forces, which Theodosius opposed to Eugenius. Theodosius gave the Empire of the East to his son Arcadius, under the guidance of Rufinus; and to his other son Honorius, the Empire of the West, with Stilicho for his guardian. Honorius was a mere child, and had no ability, and Stilicho really possessed the imperial power in the west, after the death of Theodosius. The only person that he had to fear was Rufinus, and Stilicho got rid of him by sending Gaina, a Gothic prince, at the head of an army to Constantinople, with instructions to put Rufinus to death. When Gaina arrived, and Rufinus and the emperor Arcadius were reviewing the troops, Rufinus was surrounded by the soldiers and killed (A.D. 395). But a new enemy to Stilicho sprung up in Eutropius, a eunuch, who gained the confidence of Arcadius; and Gaina also deserted him, and was rewarded with a high office in the Eastern Empire.

Stilicho took a fleet to the Peloponnesus A.D. 396 to oppose Alaric, who had carried his ravages there; but Alaric made his escape, and was received into the service of Arcadius. On his return to Italy, Stilicho prepared to attack Gildo in Africa (A.D. 397); but he did not go in person. He sent Masczil, the deadly enemy of his own brother Gildo, who finished the war in one campaign, and put Gildo to death. It was about this time that the Emperor Honorius married Maria, the daughter of Stilicho and Serena.

In A.D. 400 Alaric advanced from Illyricum to invade Italy. The emperor was alarmed at the approach of the barbarian, but Stilicho prepared to receive him by summoning the imperial troops from Rhætia, where most of them were then employed. Alaric being checked in his progress by the siege of Aquileia, withdrew towards the Danube to strengthen himself. In A.D. 402 he advanced upon the imperial residence of Milan, while Stilicho was absent recruiting the forces. Stilicho returned just in time to save the emperor, who had fled before the Goths. He defeated Alaric at Polentia on Easter Monday (A.D. 403), or according to other accounts Alaric defeated him. However this may be, peace was concluded

with Alaric, and he retired across the Po, followed by a Roman corps who were sent by Stilicho to watch his movements, for it was known that Alaric designed to surprise Verona. A fresh treaty was made with the barbarian, and he left Italy.

Italy was again invaded in A.D. 405. Radagaisus entered the country at the head of a large body of Germans, and crossing the Po entered Etruria. He was on the point of taking Florence, when Stilicho surrounded the barbarians, and with the aid of famine and disease compelled them to surrender. Radagaisus was put to death, and the barbarians were sold for slaves.

The province of Gaul, from which Stilicho had been obliged to withdraw the garrisons, was invaded about the end of A.D. 406 and the beginning of 407, by Vandals, Alani, Suevi, Burgundians, and other Germanic tribes. In Gaul these barbarians were opposed by Constantine, who had shortly before been raised from the condition of a common soldier to the rank of emperor by the soldiers in Britain, and now made himself master of Gaul and Spain by entering into a league with some of the barbarians.

Before the invasion of Radagaisus, Stilicho had made a treaty with Alaric with the view of inducing Honorius to go to war with his brother. Alaric now demanded his subsidies; and the senate at Rome was induced by Stilicho's influence to buy off the barbarians. Four thousand pounds of gold were granted to Alaric under the name of a subsidy. (Zosim., v. 29.) The desire of Stilicho to maintain peace with Alaric was interpreted by his enemies as a treacherous partiality for the enemy of the Empire, and all the calamities of Italy were imputed to Stilicho. Honorius now began to fear and suspect his minister; and this feeling was fostered by a cunning hypocrite of the name of Olympius, whom Stilicho had introduced to the court, and who had gained the confidence of the emperor.

In May, 408, Arcadius died, leaving a son, Theodosius, eight years old. Honorius proposed a journey to the east to regulate the administration. Stilicho represented to him the dangers of such an undertaking, and it was determined that Stilicho should go to Constantinople. An army was assembled near Pavia, and Honorius went thither to inspect it, while Stilicho was making preparations for his departure. The eunuch Olympius represented to the emperor that Stilicho was conspiring with Alaric, that he intended with his assistance to raise his son Eucherius to the throne, and to restore paganism in the Empire. He also contrived to influence the soldiers at Pavia, who revolted, and killed several of their principal officers, who were represented to them as the friends of Stilicho. As soon as the intelligence of the revolt at Pavia had arrived, Stilicho's friends advised him to march against his enemies; but he hesitated till it was too late. At midnight, Sarus, a Goth, made an attack upon Stilicho's tent, and cut down his guards. Stilicho escaped to Ravenna, and took refuge in a church. He was treacherously induced to come out, and as soon as he had left the threshold he was put to death by Count Heraclian, who was waiting for him with a band of soldiers, on the 23rd of August, 408. His family and his friends were persecuted, and many of them put to death.

The history of Stilicho has come down to us in a manner which scarcely enables us to choose a due medium between the extravagant praise of Claudian and the charges of his enemies, or of such writers as were obliged to join in the general clamour that was raised against him after his fall.

STILL. [DISTILLATION.]

STILL, JOHN, the son of William Still, of Grantham, in Lincolnshire, was born in 1543, and became a student of Christ's College, Cambridge. In 1570 he was appointed Lady Margaret's Professor in the university. He afterwards held livings in Suffolk and Yorkshire, and was successively master of St. John's College and Trinity College. In 1588 he was chosen prolocutor of the convocation; and, in 1592, he was raised to the bishopric of Bath and Wells, which he held till his death in 1607. The historians of the drama concur in believing him to have been the author of a coarse but humorous play, which, till the recent discovery of 'Ralph Royster Doyster,' was held to be the earliest extant work known in England by the name of a comedy. It is called 'a ryght pithy, pleasaunt, and merie Comedie, intytuled, Gammer Gurton's Nedle: played on stage not long ago, in Christe's Colledge in Cambridge. Made by Mr. S., Master of Art,' 1575. 'Gammer Gurton's Needle' is in Hawkins's 'Origin of the English Drama,' and in the second volume of Dodsley's 'Old Plays.'

STILLING, JUNG, JOHANN HEINRICH, born at Gründ, in Westphalia, 1740. He commenced life as a tailor, but soon relinquished that business for a situation as teacher in a school, and afterwards became a private tutor. He saved a little money, which enabled him to pursue the study of medicine at Strassburg, where he became acquainted with Göthe, at whose suggestion he wrote his interesting biography 'Lebensgeschichte' which, as well as all his other works, was published under the name of Stilling. Stilling practised as physician for some time in Eberfeld, and in 1778 was appointed professor in the Kameralschule of Lautern, in 1787 in that of Marburg, and in 1803 in that of Heidelberg. He died in Karlsruhe in 1817.

As a physician, Stilling's great talent was in diseases of the eye, and he is said to have restored upwards of 2000 persons to better sight. As a writer he was popular, and the sect of Pietists in Germany look up to him with great affection. The most celebrated of all his works is the 'Theorie der Geisterkunde.' A complete edition of his works was published at Leipzig, in 1835, in 13 vols. 8vo., edited by Dr. J. Grollman.

STILLINGFLEET, EDWARD, was born at Cranbourn, Dorsetshire, April 17, 1635. He entered St. John's College, Cambridge, in 1648, and obtained a fellowship in 1653. After taking his degree of M.A. he was private tutor in the families of Sir Roger Burgoin, and of the Hon. Francis Pierrepoint. In 1657 he was presented to the rectory of Sutton by Sir R. Burgoin.

In 1659 he published his first work, 'Irenicum,

or the Divine Right of particular Forms of Church Government examined.' This work was intended to prove that no particular form of church government is appointed in the New Testament, but this opinion he afterwards retracted. The work on which Stillingfleet's reputation mainly rests is his 'Origines Sacræ, or Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures,' which was published in 1662.

Stillingfleet was an indefatigable polemic. During the greater part of his life, he had his hands full of controversy, with the Romanists on the one side, and the Nonconformists on the other. In the year 1664 he engaged, at the request of Dr. Henchman, bishop of London, in the defence of the views maintained by Laud in his conference with Fisher the Jesuit. In 1665 he was presented to the rectory of St. Andrews, Holborn, London, having been already appointed preacher at the Rolls chapel. This was speedily followed by his appointment as lecturer to the Temple, and chaplain in ordinary to Charles II. In 1668 he took the degree of D.D., and was nominated by Charles, in 1670, canon residentiary of St. Paul's, and in 1678 dean of the same cathedral. In the meantime he published his 'Discourse concerning the Idolatry practised in the Church of Rome, and the Hazard of Salvation in its Communion,' 1671; other tracts against the Roman Catholics, and also against the Socinians; and 'A Letter of Resolution to a person unsatisfied about the Truth and Authority of the Scriptures.'

In 1680 he plunged into a new controversy, by preaching before the lord mayor a sermon, on Philippians, iii., 16, which he afterwards published, entitled 'The Mischief of Separation.' This sermon consisted of a violent attack on the Nonconformists, which was little expected from the author of the 'Irenicum.' The sermon was replied to by Owen, Baxter, Howe, and other eminent Nonconformists. Stillingfleet replied to his opponents in a large quarto volume, entitled 'The Unreasonableness of Separation,' 1681, in which he traces the history of Nonconformity; and Baxter rejoined in 'A second true Defence of the mere Nonconformists, against the untrue Accusations, Reasonings, and History of Dr. Edward Stillingfleet,' 1681, to which the Dean made no reply. In 1685 Stillingfleet published his 'Origines Britannicæ, or Antiquities of the British Churches.'

When James II. revived the court of ecclesiastical commission, Stillingfleet refused to be a member of it; and after the Revolution he published 'A Discourse concerning the Illegality of the Ecclesiastical Commission, in answer to the Vindication and Defence of it,' 1689. Under Charles and James he was prolocutor of the convocation.

After the Revolution of 1688, Stillingfleet's services to the Protestant cause were rewarded with the bishopric of Worcester, to which he was consecrated in 1689. Soon afterwards, in 'A Vindication of the Trinity, with an Answer to the late Objections against it from Scripture, Antiquity, and Reason,' he made some objections to Locke's definition of substance, and to his theory of ideas in general, which gave rise to a sharp contest between him and Locke.

Stillingfleet died of gout, at Westminster, March 27, 1699. His works were printed in 1710, in 6 vols. folio, and a volume of his miscellaneous works was published in 1735 by his son the Rev. James Stillingfleet, canon of Worcester. Stillingfleet had collected a splendid library, which Dr. Marsh, archbishop of Armagh, purchased, in order to throw it open to the public in Dublin. The MSS. were bought by the Earl of Oxford, and are now in the Bodleian Library.

STILLINGFLEET, BENJAMIN, grandson of Dr. Stillingfleet, bishop of Worcester, was born in 1702. His father, originally a physician, and one of the professors at Gresham College, afterwards entered into holy orders, and died in 1708. Benjamin was educated at Norwich grammar-school, and in April, 1720, he entered as subsizar at Trinity College, Cambridge. He took the degree of B.A. in 1723. Soon afterwards he quitted the university, became tutor to the son of Mr. Wyndham of Felbrig, Norfolk, and in 1737 accompanied his pupil to the Continent. On his return to England Mr. Wyndham settled on him an annuity of 100*l.*; and the friendship of Mr. Price, whose acquaintance he had made when at Rome, enabled him to take up his abode in a small cottage near that gentleman's seat at Foxley, in Hertfordshire. In 1759 he published a collection of 'Miscellaneous Tracts on Natural History,' which consisted of translations from the writings of Linnæus and his pupils. Mr. Stillingfleet's preface to this work did much towards rendering the Linnæan system popular in this country.

'A Treatise on the Principles and Power of Harmony,' published in 1771, which is an abridgment of Tartini's 'Trattato di Musica,' was the only other work which appeared during his life; but he left at his death, which took place in London, Dec. 15, 1771, six volumes in manuscript, of a collection towards a 'General History of Husbandry,' of which an analysis is given in his biography by Mr. Coxe.

STILLI'NGIA, a genus of plants of the natural family of *Euphorbiaceæ*, so named in compliment to Dr. Stillingfleet, known as an English botanist. *Stillingia sebifera*, or the Tallow-Tree of China, at one time attracted considerable attention, and was introduced into various European colonies in the East and West Indies. It may be met with in our hothouses. Dr. Roxburgh describes the plant as common in his time about Calcutta, but that it did not yield any useful product, and was therefore only an ornamental tree, being in flower and fruit most parts of the year. It is found in China on the borders of rivulets, and is also cultivated. It grows to the height of a pear-tree, having a trunk and branches like the cherry, and foliage like the black poplar, but which turns red in autumn. It was met with in Chusan, and seeds were sent home, which were sown in the Horticultural Society's Garden at Chiswick. The fruit of this tree furnishes the Chinese with candles, and oil for their lamps. The seed-vessels and seeds are bruised, and then boiled in water. The fatty particles rising to the surface are skimmed off, and on cooling condense into tallow. To give it greater consistence some

wax is added, together with linseed-oil, in the proportion of three parts to ten of the tallow. The candles made with it are beautifully white. Sometimes they are coloured red by the addition of vermilion. These candles are sometimes said to be coated with wax procured from another Chinese tree (probably *Ligustrum lucidum*), which forms an external crust and prevents them from running. This tallow is also employed in medicine instead of lard.

STILPO, a native of Mégara, was a philosopher of the Megarian school, who lived about the year before Christ 300. He enjoyed the highest estimation among his countrymen, both as a man and a philosopher. When Demetrius Poliorcétes took Mégara, he commanded his soldiers to spare the habitation of the philosopher, who, in his eyes, was the wisest of all the Greeks. Cicero ('De Fato,' 5) states that Stilpo, who was naturally fond of wine and women, exercised such control over his passions, that no one ever saw in him any sign of indulgence in sensual pleasures.

Stilpo followed the doctrines of the Megarian school, but he went further, and denied the objective reality of the ideas of species and genera. He asserted that the character of a philosopher consisted in perfect freedom from passions; and in this he was followed by his disciple Zeno, the founder of the Stoic school of philosophy.

STILTON. [Huntingdonshire.]

STIMULANTS, or *Excitants* (in Medicine), agents which increase vital action, first in the part to which they are applied, then of the system generally, and perhaps ultimately of some particular organ; and when this organ is a gland or secreting organ, a renewed or augmented secretion is observed. The nervous system seems to be the part which they chiefly influence, and through it the vascular, and in many cases the muscular. This is well seen in the simple effect following the employment of ammonia in a fainting fit, where the application of the vapour of ammonia, or its carbonate (smelling salts), to the nostrils, stimulates the brain, and so restores the heart's action, by which the circulation is resumed, and all parts dependent on it vivified. Aromatic vinegar, electricity, galvanism, and the sudden application of cold, have a like effect.

Stimulants are of two classes: the former comprise medicinal substances; the latter, warmth, cold, electricity, galvanism, and mental agents, such as music (when lively), joy, hope, &c.

STINGS, in Botany, a kind of hair with which many plants are furnished, which secretes a poisonous fluid, which when introduced under the skin of animals produces inflammation. Many plants are endowed with this kind of protection, the most common example of which is seen in the stinging nettles. In these plants the sting consists of a delicately elongated tube of cellular tissue, which is seated upon a gland formed of the same tissue. The poisonous fluid is secreted in this gland, and when any pressure is made upon the gland, the fluid passes into the tube, just in the same manner as the venom passes up the fang of a serpent's tooth.

STIPA, a genus of grasses belonging to the tribe *Stipaceæ*. *S. pennata*, the only British species, is a very beautiful plant, and is common in our gardens. Found on rocks in Long Seadale near Kendal.

STIPES, in Botany, a term applied to almost all parts of a plant performing the functions of a stalk, with the exception of the petiole and flower-stalk. It is frequently used to express the whole stem of a plant.

STIPULES, in Botany, are those organs which are found at the base and on each side of the axils of the leaves of plants. They are not of constant occurrence, not being found in all plants, but where they occur they frequently characterise a whole family, as in *Leguminosæ*, *Rosaceæ*, *Malvaceæ*, &c. These organs are frequently very like leaves, and present themselves in the various forms in which leaves are found. But they are always to be distinguished from leaves by their position at the base of the leaf-stalk. In many cases they are green like the leaf; they sometimes have petioles, and are sometimes sessile and cut into teeth, lobes, &c. In the *Mimosas* the stipules frequently degenerate into hardened spines. In the family of *Polygonaceæ* they are membranous, and being united together they form a sheath around the stem, which is called an *Ochrea*. The stipules in *Cucurbitaceæ* assume the character of tendrils, and in *Trapa natans* they appear under the form of elongated filamentous bodies.

The stipules appear to be modifications of the leaves, but may always be distinguished from these organs by their being placed at the base of the leaf-stalk. Another distinction would also be found in their not possessing buds in their axils. This law however is subject to some exceptions, as stipules are sometimes found with buds in their axils, thus proving their theoretical identity with the leaf.

The function of the stipules generally is not very obvious, but in many cases there can be no doubt that they act as a protection to the young bud, as is seen in *Magnolia*, and more particularly in the Tulip-Tree (*Liriodendron*), where they embrace the young bud in the form of two little valves. In compound leaves the leaflets are often furnished with smaller stipules. These have been called by De Candolle *Stipels*. Examples of these may be seen in the species of *Hedysarum*.

STIRLING. [Stirlingshire.]

STIRLING, WILLIAM, EARL OF, the son of Alexander Alexander of Menstrie, is generally stated to have been born about 1580. After the death of his father in 1594, he accompanied Archibald, seventh earl of Argyle, in his travels on the Continent. Between 1603 and 1614 he published several poems. The tragedy of 'Darius' was printed at Edinburgh in 1603: it was reprinted at London in 1604, with the addition of the tragedy of 'Croesus,' a 'Parænesis' addressed to Prince Henry, and 'Aurora,' containing the 'first fancies' of the author, and two short pieces. The two tragedies were again printed at London, with the addition of the 'Alexandræan Tragedy,' and 'Julius Cæsar,' in 1607. 'An Elegie on the Death of Prince Henry' was published at Edin-

burgh in 1612, along with 'Some Verses to his Majestie,' and 'A Short View of the State of Man.' The earliest edition of 'Domesday, or the Great Day of the Lordes Judgment,' is that of Edinburgh, 1614. With the exception of two books of an unfinished poem, 'Jonathan,' he published no poetry after 1614. Alexander was among the first Scotchmen who wrote English; he was Drummond's senior, and was occasionally consulted by him regarding style and rhythm; but his poetry is diffuse and pointless. In 1614 King James knighted him, and appointed him master of requests. In 1621 James granted him the territory of Nova Scotia, but little progress was made with Sir W. Alexander's scheme of colonisation till after that king's death. On the accession of Charles I. Sir William developed his scheme in a pamphlet entitled 'An Encouragement to Colonies,' published in 1625. The king was so won by the project, that he made Sir William Alexander lieutenant of New Scotland, and founded, in connection with that colony, the order of knights-baronets in Scotland. Alexander's idea seems to have been to establish a feudal state, of which he was to be the head, under the sovereignty of the king of England. Ultimately however he was induced to cede his claims to the French. He obtained from the king a charter of the lordship of Canada in 1628, and from the council of New England a grant of all that part of New England between the rivers Kennebeck and St. Croix, and of the island of Stirling (now Long Island, in the state of New York), in 1635. He made vigorous efforts to settle this island, and his eldest son contracted the disease which carried him to his grave before his father, by the excessive hardships he underwent in trying to found a settlement on the St. Lawrence. While busied with the Nova Scotian project, he obtained the privilege of coining for Scotland a sort of base copper-money, called 'turners.' Besides the large grants of land in America, the king granted to him several baronies in Scotland between 1628 and 1636. He was appointed secretary of state for Scotland in 1626; made keeper of the signet, 1627; a commissioner of Exchequer, 1628; and an extraordinary lord of session in 1631. He was created Viscount Stirling and Lord Alexander of Tullibody on Sept. 4, 1630, and Earl of Stirling, Viscount Canada, and Lord Alexander of Tullibody, on June 14, 1633. William earl of Stirling died Feb. 12, 1640.

STIRLING, JAMES, an English mathematician of considerable eminence. He must have been born near the end of the 17th century, and he was alive in 1764.

Mr. Stirling's first work, entitled 'Lineæ Tertii Ordinis Newtonianæ, sive,' &c., published at Oxford, in 8vo., in 1717, is a commentary on Newton's tract on the subject of lines of the third order. But the work which contributed most to his reputation is his 'Methodus Differentialis, sive Tractatus de Summatione et Interpolatione Serierum Infinitarum,' London, 4to., in 1730.

STIRLINGSHIRE, an inland county of Scotland, is bounded N. by Perthshire, N.E. by Clackmannanshire and a detached portion of Perthshire, E. and S.E. by Linlithgowshire, S. by Lanarkshire and a detached portion of Dumbartonshire, and S.W. and W. by the main portion of Dumbartonshire. The greatest length, N.W. to S.E., is 42 miles; the greatest breadth at right angles to the length is 25 miles. There are two insulated portions surrounded by Perthshire and Clackmannanshire. The area is 489 square miles. The population in 1841 was 82,057. The county is included between 55° 54′ and 56° 20′ N. lat., and 3° 40′ and 4° 40′ W. long.

Surface and Geology.—The north-western extremity of the county is included in the district of the Highlands, and is occupied by the mountain-range which forms the western extremity of the Grampians, and separates Loch Lomond from Loch Chon and Loch Ard, in which the Forth rises. Of this range the principal mountain is Ben Lomond, which has an elevation of 3000 feet above the level of the sea. This range consists of primary rocks, chiefly slates.

East of this district the face of the country becomes more level, and is occupied by rocks of the old red sandstone group; but in the central parts of the shire it again rises into hills, which form the group of the Lennox Hills, extending from E.N.E. to W.N.W. from the Forth about Stirling to the Clyde near Dumbarton. They are estimated to attain in their highest part the height of 1500 feet, and present many indications of a volcanic origin. The Campsie Fells, which constitute part of the group, and skirt the valley of the Kelvin, consist chiefly of large tabular masses of trap, the geological position and character of which vary considerably. That part of the country which skirts the Lennox Hills to the S. and E., and is drained by the Kelvin, the Carron, and other streams, belongs to the coal district of Central Scotland, and yields coal, ironstone, freestone, and limestone, in considerable quantity. The carses or dales are generally occupied by the later formations or by alluvium.

Rivers.—The county belongs partly to the basin of the Forth and partly to that of the Clyde. The Duchray Water, one of the principal affluents of the Forth, and which some regard as the principal head of that river, takes its rise from several springs on the northern and eastern slopes of Ben Lomond, and forms for five or six miles the boundary of the county. It then enters Perthshire, but again touches the border of the county after its junction with the other principal head of the Forth, which afterwards mostly forms the northern boundary of the county till it receives the Avon, which forms the eastern boundary. Its Stirlingshire tributaries are all small; the Bannockburn, the Carron, and the Avon are the principal. Some more important streams, the Teith, the Allan, and the Devon join it on the opposite bank. Up to Stirling bridge the Forth is navigable for small sailing-vessels and steam-boats. No part of the Clyde is in this county: but the Endrick and its feeder, the Blane Water, which drain the chief part of the district between the Highlands and the Lennox Hills, and the Kelvin, which drains the southern part of the county, are both affluents of the Clyde.

The Endrick does not indeed immediately join the Clyde, but falls into Loch Lomond, which communicates with the Clyde by means of the Leven Water.

Canals and Railways.—The Great Canal, which connects the Forth and the Clyde, has part of its course in this county. The manufactures of Glasgow are conveyed by this canal to the eastern parts of the island; and goods of various kinds conveyed back. The Edinburgh and Glasgow Union Canal commences near Edinburgh, and joins the Forth and Clyde Canal at Port Downie, near Falkirk.

The Edinburgh and Glasgow Railway passes through the southern part of this county, and the Scottish Central Railway joins it at two points and extends northwards to Perth, and the other railways of the east coast of Scotland.

Soil and Agriculture.—The hilly district of the centre and the highland tract of the north-west, with the lower lands that lie between them, are in most places bleak and sterile; but the carse or valley of the Forth, from the neighbourhood of Falkirk to Stirling, consists of low and fertile alluvial lands. The eastern side of the county presents a finely-diversified appearance.

In the highland district, with an area of above 76,000 acres, only about 1500 acres are of arable land. There are above 4000 acres of natural woods or plantations, the latter being chiefly of oak and larch. The greater part of this district is waste land, used as a sheep-walk or pasture. About 16,000 or 17,000 sheep, chiefly black-faced and of small size, are reared yearly; and about 1300 or 1400 cows of black cattle, and a very few horses.

In proceeding from the highland district towards the south-east the quantity of cultivable land increases. In the lower ground which separates the highlands from the Lennox Hills, and in the straths or valleys of the Forth, north of those hills, and of the Kelvin, south of them, the quantity of arable land is greater in proportion.

The eastern part of the county is the most fertile, and, in an agricultural point of view, the most important. It comprehends the carse or valley of the Forth below Stirling, the soil of which consists principally of a bluish clay mixed with sand. There is here comparatively little waste land; the soil is almost wholly occupied in tillage or in plantations; and the greater facility for obtaining manure by means of the navigation of the Forth has tended to the improvement of agriculture. A six-year shift is common; and the produce in wheat, barley, and beans is larger in proportion to other produce than in the more western districts of the county. Gardens and orchards are numerous and productive.

Divisions and Towns.—The shire contains 20 entire parishes, and part of 5 others. One member is returned to Parliament for the county, one for the Falkirk District, and one for the Stirling District.

The following are the principal towns and villages, with the population of each in 1841:—

Alva, a village, is in the parish of Alva, which is locally in Clackmannanshire. It stands on the small river Devon, about 7 miles N.E. from Stirling, and has manufactures of tartans, blankets, &c. Population of the village, 2092.

Balfron, a village, 19 miles W.S.W. from Stirling, is neatly built. There is a large cotton-manufactory in the neighbourhood. Population, 1568.

Carronshore, a village, 2 miles N. by W. from Falkirk, is near the Carron Iron-Works, which are perhaps the largest in Europe. There are 4 or 5 blast or smelting furnaces, 4 or 5 cupola furnaces, and about 20 air furnaces; besides mills for grinding fire-clay, boring cylinders, grinding and polishing the metal, &c. Water and steam are the moving powers employed. The goods manufactured are machinery, agricultural instruments, and warlike implements, as cannon, carronades (which take their name from this place), mortars, shot, and shells. The tide rises in the river Carron as high as Carronshore, and at spring tides to the iron-works, which are a little higher up. A double iron-railway extends from the works to the village. There is abundance of coal in the neighbourhood, but the iron-stone and limestone are chiefly brought from a distance. Vessels of 150 tons burthen come up to the village. About 2000 persons are employed at the iron-works. Population of the village, 385.

Denny, a village, 6 miles W. from Falkirk, is situated near the N. bank of the river Carron. Population of the village, 1831.

Falkirk, a market-town and contributory borough, 42 miles S.E. from Stirling, consists of a principal street extending along the road from Edinburgh to Stirling, with other streets branching off from it or running parallel to it. The Edinburgh and Glasgow Railway passes by the town, and the Scottish Central Railway extends thence to Stirling and other places. The town stands on an elevation with a gentle declivity on each side. It contains many handsome houses, is lighted with gas, and well supplied with water. A handsome tower with a spire 140 feet high, contains a public clock. The town is chiefly indebted for its prosperity to an extensive inland trade, and to the iron-works, canals, and collieries, in the neighbourhood. Population of the town, 8209. The parliamentary District, which returns one member, consists of Airdrie, Falkirk, Hamilton, Lanark, and Linlithgow: population, 37,776.

Grangemouth, a town and port, is situated at the mouth of the river Carron, near the Frith of Forth, at the junction of the Grand Canal with the Carron. The town of Grangemouth was commenced in 1777 by Sir Lawrence Dundas, in the well-founded expectation that its connection with the canal would give it some consequence as a port. Having been built on a regular plan, the streets are well laid out, and there are some good neat houses. From the flatness of the surrounding country and the adjacent sea-dykes and canal, the place has the appearance of a Dutch village. The Grand Canal terminates here in a basin and harbour, and two extensive wood-ponds. The basin and harbour admit large vessels, and smaller vessels can proceed by the canal, the traffic on which is very great. Great efforts have been

made of late years to improve the port by the construction of a vast sea-loch, the formation of a wet-dock, and the deepening of the river Carron. Grangemouth has a custom-house. Alloa, Stirling, and Kincardine are included in the port. Population of the town, 1488. Kerse-House, the seat of the Earl of Zetland, near the town, stands in a finely-wooded park.

Kilsyth, a burgh of barony, 13 miles E.S.E. from Falkirk, stands at the junction of the roads from Falkirk and Stirling to Glasgow. It is irregularly laid out, and the houses are small and mean-looking. The streets are lighted with gas. The parish church is a modern building of considerable elegance, but too small for the population, and a new church has been built in the village of Banton. The manufacture of the town consists almost entirely of hand-loom weaving to supply orders from Glasgow. Population of the town, 4106.

Lauriston, a village, 1½ mile E. from Falkirk, is laid out on a regular plan, with a square in the centre. Population of the village, 2821.

Saint Ninians, a village, 1 mile S. from Stirling, has manufactures of nails, tartans, and tartan shawls. There are also tan-yards. Population of the village, 1295.

Stirling, the county-town of Stirlingshire, a contributory borough, and a royal burgh governed by a provost, 4 baillies, and 15 councillors, is 469 miles N.N.W. from London by the railway through Edinburgh and Falkirk. The town is situated on the south bank of the Forth, partly on an eminence, which rising from the S.E., terminates on the N.W. in a precipitous rock, on which Stirling Castle stands, and partly on the lower ground to the N.E. and S.E. of this eminence. The lower portions of the town are comparatively modern; the upper portions are mostly ancient. The more ancient streets are narrow, winding, and in many places ill paved, with several decayed houses; but some streets have been much improved in the present century, and are lined with good shops. The town is lighted with gas. The old church, a fine gothic building, stands near the castle; it has a massive tower of decorated English architecture at its west end. It was originally the conventual church of a Franciscan friary, founded by James IV. in 1494. The prospect which the Castle-Hill commands is very fine. The Castle presents a singular assemblage of buildings, some of them ancient, but altered and adapted to the purposes of modern warfare. The palace, built by James V., is now converted *into* a barrack; and the adjacent hall, built by James III. for the meeting of the Scottish parliament, has been used for a riding-school. Adjacent to this is the Chapel Royal, built by James III., and rebuilt by James VI. (I. of England), now employed as a store-room and armoury. S.W. of the Castle is the space formerly occupied by the king's park and garden: it is surrounded by an old wall, but is chiefly occupied as pasture or cultivated ground. South of the church is Gowane's Hospital, built in 1639. The old bridge over the Forth is an inconvenient structure of stone, but a new and more convenient bridge has been built just below it. The town-house is an old building with a spire; behind it is the gaol. There are commodious corn and meat markets, and a handsome building, the Athenæum, devoted to literary purposes. The chief manufactures are of tartan and tartan-shawls, yarns, cotton goods, malt, leather, soap, and candles. There are dye-houses for yarns, home-made cloths, and silks, rope-yards, and breweries. Considerable trade is carried on in corn, wood, coals, bricks, tiles, lime, and wool. About a hundred vessels are said to be engaged in the trade up the Forth to Stirling; and there is constant communication by steam with Newhaven, near Edinburgh, and the intermediate places on the Forth. Population of the burgh, 8307. The parliamentary borough includes the village of St. Ninians and the hamlet of Newhouse: population, 10,701. The Stirling parliamentary District, which returns one member, consists of Culross, Dunfermline, Inverkeithing, Queensferry, and Stirling: population, 27,644.

History and Antiquities.—Stirlingshire was, at the most ancient historical period, included in the territory of the Δαμνόνιοι (Damnonii), a nation mentioned by Ptolemæus and by Richard of Cirencester, who calls them Damnii. They were subdued by Agricola, A.D. 80, who formed a line of forts through their territory, reaching across the island from the Boderia Æstuarium, or Frith of Forth, to the Glotta or Clyde. This line of forts the Roman general Lollius Urbicus, in the reign of Antoninus Pius, about A.D. 140, connected by a continuous rampart of earth or turf. The rampart of Urbicus, or, as it is sometimes called from the emperor in whose reign it was constructed, the Rampart of Antoninus (Antonini Vallum), commenced on the shore of the Frith of Forth, a little to the east of Borrowstowness, and ran westward through Linlithgowshire, Stirlingshire, Lanarkshire, and Dumbartonshire, to the Clyde at West Kilpatrick. It consisted of a comparatively slight rampart, with a deep ditch on the north side, and a military road accompanying it on the south side: the remains of it are popularly known as Graham's or Grime's Dyke, a name the origin of which is not ascertained. There are some other antiquities referable perhaps to the Roman period, or to the periods immediately before or after it. There are a few of the stone monuments commonly regarded as Druidical, earthen forts, cairns, and mounds or barrows.

In the Anglo-Saxon times Stirling became an important town, from its central situation, its strong fortress, and its commanding the passage over the Forth. Cambuskenneth Abbey, one of the most important in Scotland, was founded in 1147, by David I., king of Scotland, for regular canons of St. Augustin, on a small peninsula on the north side of the Forth, a little below Stirling. Of this edifice some ruined walls and the belfry tower still exist.

From the time of the invasion of Scotland by Edward I. in 1296, down to the rebellion of 1745-6, Stirling Castle was a place of great consequence. It was frequently besieged, and was sometimes held by the Scotch, sometimes by the English—sometimes by royalists and sometimes by rebels. It was also the occasional residence

of the Scottish kings, till James VI. of Scotland became James I. of England.

STIVER. [Money.]

STIZOLO'BIUM, a genus of plants which was so named by Persoon. The species have now been removed chiefly to *Pachyrhizus* and to *Mucuna*. Of the latter of these *Stizolobium* now forms a subgenus. The principal species of *Mucuna* have already been mentioned under the article Cowitch. Another valuable but little known species is *Mucuna utilis*, the *Pois Noire* of the islands of Mauritius and Bourbon, and thought to be a native of Arabia. It is universally employed in the above islands for enriching the soil for the cultivation of sugar.

STJERNSTOLPE, JONAS MAGNUS, was born Dec. 8, 1777, in the province of Södermanland, in Sweden. Baron Fletwood and others of his friends put him to school at Strengnäs, where he distinguished himself, and whence he was sent to finish his studies at Upsala. In 1802 he was taken into the family of M. Beskow, a merchant, as tutor to his two sons, but he shortly afterwards accepted a small appointment in a public office (the Krigs-Expedition), devoting only his leisure time to literary occupations. These consisted at first merely of translations of Müller's 'Siegfried' and other German romances, to the extent of about 30 volumes. But he afterwards translated 'Don Quixote,' 'Oberon,' some of the tales of Voltaire, Pope's 'Rape of the Lock,' Blumauer's 'Æneis,' &c.; not to mention a number of minor pieces, both from ancient and modern poets. Among his original productions the principal are, 'Lunkentus,' a dramatic popular tradition; the 'Argonauts;' and his comic tales in verse.

Notwithstanding his decided taste for works of fancy and humour, satire and wit, his reading extended to others of a very different class, to mathematics and the physical sciences, geology and astronomy, to which last study he was greatly attached. His epistolary correspondence was very extensive. He died Sept. 17, 1831.

STOAT. [Weasels.]

STOBÆ'US, JOANNES, a native of Stobi in Macedonia, whence he derives his name Stobæus, lived either at the end of the fifth or in the sixth century of our æra. Respecting his life no particulars are known. We possess through him a number of extracts from ancient Greek writers, collected from more than five hundred authors, both in prose and verse. He put them together, and arranged them according to subjects for the use and instruction of his son Septimius. The words of Greek poets are quoted verbatim, but in regard to prose writers he followed two different methods; sometimes he quotes the author's own words, and gives real extracts, and sometimes he gives a mere summary of what his author contained. In our MSS. the collection is divided into three books, which form two separate works. The first and second books are usually called Ἐκλογαὶ φυσικαί, διαλεκτικαὶ, καὶ ἠθικαί, and the third Ἀνθολόγιον, or 'Sermones.'

The editio princeps of the 'Eclogæ' is that by W. Canter, Antwerp, 1575, fol., with a Latin translation. It was reprinted, together with the 'Sermones' (the first edition of which was edited by Trincavelli, at Venice, 1536, in 4to.), at Geneva, 1609, in fol. The best modern edition of the 'Eclogæ' is by A. H. L. Heeren, with notes and a Latin translation, Göttingen, 1792—1801, 2 vols. 8vo.; and the best edition of the 'Sermones' is by T. Gaisford, Oxford, 1822, 4 vols. 8vo., reprinted at Leipzig, 1823 and 1824, in 4 vols. 8vo.

STOCK, the English name for the genus of plants named by Brown *Mathiola*. [Mathiola.] Many of the species of this genus are great favourites in gardens, on account of their handsome flowers and fragrant smell. In order to raise the more valued kinds, as the Double-Stock Gilliflower, the Brompton Stock, and Queen's Stock, the seed should be saved from plants growing among double flowers, as it has been proved that such seed produces more plants with double flowers than the seed obtained from plants bearing double flowers.

STOCKADE, in Fortification, is the name given to a wall constructed by planting upright in the ground squared trunks of trees, or rough piles of timber, so as to inclose an area which is to be defended. The trunks or piles are planted close together; and at intervals of three feet from one another loop-holes are cut through them, or notches a few inches long are cut down, vertically, from the top, through which the defenders may direct a fire of musketry on the assailants.

Stockades are still frequently constructed as temporary fortifications in countries which abound with timber, as in North America and the East Indies; and, among uncivilised nations, these, and rude parapets of earth, are the only kinds of fortification which have been executed. On the frontiers of the United States of North America, during a war, stockades consisting of roughly-hewn trunks of trees planted close together in upright positions and pierced with loop-holes for musketry are very frequently constructed. At each of the angles of the enclosure there is formed a sort of Blockhouse, consisting of very thick logs of timber placed horizontally: it has a lower and an upper story, the angles of the latter projecting over the sides of the former, so that the work serves as a bastion to flank the stockade.

STOCKBRIDGE. [Hampshire.]

STO'CKHOLM, the capital of Sweden, is situated in 59° 20′ N. lat and 18° E. long., on the channel by which the lake Mälar discharges its waters into the Baltic. The distance from the sea by this channel is 36 miles.

The city of Stockholm is built partly on the continent and partly on nine islands formed by the above-mentioned channel: the islands are called *holmen*. In the middle of the channel is the island of Stockholm, also called Staden, because the town was originally first built on it, and Riddar Holm (the island of the knights). South of them is the large island of Söder Malm, at the western extremity of which are Lang Holm and Räkning Holm. North of the channel a large portion of the town is built on the continent and called Norr Malm. With this part is united the island of Kongs Holm (King's Island), which lies west of it, and those of Blasii Holm, Skepps

Holm (Ship Island), and Kastell Holm, which are east of Norr Malm.

The Staden, or Stockholm, occupies the centre of the town, and contains several fine public and private buildings. The royal palace, an edifice of great architectural merit, stands on an eminence, and is surrounded by a large garden. Besides the apartments in which the royal family reside, it contains a library, collections of paintings, coins, and antiquities. Before the extensive court-yard of the palace, and near the banks of the channel, is the colossal statue of Gustavus III., of bronze; and in its vicinity, along the eastern shore of the island, is the proper harbour of the town, in which the largest vessels find excellent anchorage. Along it there are large storehouses for foreign goods. Farther to the west is the cathedral, or St. Nicolai Church, also called 'storkyrka,' or head church, in which the kings of Sweden are now crowned; and at some distance from it, on the Riddarhustorg (or Square of the Hall of the Knights), is the statue of Gustavus Vasa, of bronze. From the square a stone bridge leads to the Riddarholm, which is much smaller than Stockholm, but which contains several large public buildings, among which are the old palace and the old church of Riddarholmen, in which the kings and distinguished persons born in Sweden are buried, and about five thousand flags are hung up, the trophies of the Swedes in their numerous wars. The legislative body also holds its meetings here.

Söder Malm, or the southern division of Stockholm, is built on the island of the same name, which is about three miles long and nearly two miles across in the widest part: it is joined to Stockholm by a long bridge of boats, and provided with a large lock on account of the great rapidity with which Lake Mälar sometimes discharges its waters. The surface of the island is rocky and very broken; and though there are also many fine buildings near the channel, the interior of this section of the town is mostly composed of small wooden houses situated between rocks and swamps, and of gardens and corn-fields. In the Söder Malm is the great depôt of iron, whence it is shipped to all quarters of the globe. The most remarkable of the buildings are the town-hall, the Danviken or Great Hospital, and the Maria Magdalene and the St. Catharine Church. The island of Lang Holm, which is farther west, and is united to the Söder Malm by a bridge, contains the houses of correction; and on Räkning Holm, which likewise is joined to Söder Malm by a bridge, there is a park.

The Norr Malm, or northern division of the town, is on a gentle slope, which gradually rises about 200 feet above the sea-level. It is much better built than the Söder Malm, and has several fine squares and streets, among which King's Street is distinguished by many good buildings. A well-built bridge connects it with Stockholm. On the finest of the squares, called that of Gustavus Adolphus, is the bronze equestrian statue of that great king. One of the sides of the square is occupied by the opera-house, a fine large edifice. Not far from the square is the king's garden (Kongs Tregorden), a fine piece of ground, planted with

trees and used as a public promenade, in which a statue of Charles XIII. has been erected; and near it is the playhouse. Among the churches of this part of Stockholm, that of Adolphus Frederick is distinguished by its beauty. At the northern extremity of Norr Malm is the observatory, which is well provided with astronomical instruments and a library; and somewhat farther is the botanical garden. The island of Kongsholm, which lies west of Norr Malm is joined to it by two bridges. It is not much built on, but contains the great iron-foundry established by an Englishman, Mr. Owen; a large hospital, the Bible printing-office, and the royal cannon-foundry of Marieberg. Contiguous to the Norr Malm on the east is Ladugärdslandet, on which formerly were some royal farms, a part of which however has been built upon; whilst another part has been converted into a royal park, called Humlegärd (hop-garden), to which the public has access. The island of Blasii Holm, which has been converted into a peninsula by filling up the narrow channel which divided it from the continent, is north-east of Stockholm and south-east of Norr Malm, of which it now constitutes a portion. It contains some fine buildings. Contiguous to it, and only separated by a narrow channel, over which there is a bridge, is the small island of Kyrkholm, from which a long wooden bridge, leads to Skeppsholm, where the flotilla of the skära is stationed. Another wooden bridge leads to Kastellholm, a very elevated island, planted with fine trees: a castle is built here for the defence of the entrance of the harbour. The environs of Stockholm are rendered very beautiful by the islands, the channels between them, the country houses, and the gardens.

Stockholm is the seat of the government, and generally also the place where the legislative bodies meet. It contains consequently the offices of all the branches of administration and the superior courts of justice. There are several scientific and literary societies, among which the Royal Society of Sciences has greatly contributed to the advancement of natural philosophy, chemistry, and natural history. There is also a Royal Academy of Literature, History, and Antiquities; the Swedish Academy, whose object is to promote the cultivation of the native language; an academy of military sciences, an academy of liberal arts, a musical academy, and an academy of agriculture. The charitable institutions are very numerous, and in this respect Stockholm is superior to any other city in Europe of equal size. The institutions for education are also numerous. Besides a well-conducted grammar-school, there are some schools for the middling classes, and numerous elementary schools, mostly conducted on the plan of Bell and Lancaster.

The population of Stockholm in 1844 was 84,161. Stockholm is the most industrious and commercial town of Sweden. There are manufactures of cloth, cotton, calico, silk, ribands, sugar, tobacco, leather, cast-iron, and soap. Nearly the whole of the superfluous produce of the countries north and west of Stockholm is brought here, to be exported to foreign countries. It is mostly shipped in Swedish vessels. The value of the iron ex-

ported is as great or greater than the total amount of the other exports, of which the chief are timber, tar, pitch, copper, cobalt, ready-built vessels, linseed-oil and oil-cakes, tobacco, steel, bricks, and a few manufactured articles. The most active commerce is carried on with England, the United States of North America, Denmark, France, Prussia, Portugal, the Netherlands, and Italy. The most important articles of import are sugar, coffee, wine and brandy, rum, woollen and cotton manufactured goods, silk, linens, china and crockery, hemp, cotton, cheese, potash, hides and skins, tallow and candles, train-oil, dyeing-woods, raisins, almonds, pepper, cinnamon and cassia, tea, butter, and wool.

STOCKINGS. [WEAVING.]

STOCKPORT, a municipal borough and parliamentary borough, partly in Lancashire, but chiefly in Cheshire, 182¼ miles N.W. by N. from London by the North-Western Railway, and 5¾ miles S. by E. from Manchester, stands at the junction of the rivers Tame and Mersey, and consists of a number of streets irregularly laid out, with a large open market-place in the centre. The town is well paved, and is lighted with gas. The principal part of it is built on a steep and irregular hill of soft red sandstone, rising in some parts precipitously from the south bank of the Mersey. The market-place and the parish church are on a tolerably extensive level on the summit of the hill; the streets leading to them are steep and narrow. There are four bridges in or near the town, over the Mersey, and one over the Tame. The parish church is, for the most part, modern, having been rebuilt early in the present century, in the perpendicular style of architecture. It has a tower with pinnacles and pierced battlements. There are three other places of worship of the establishment, besides a number of meeting-houses for different classes of dissenters. The town also contains a grammar-school, recently rebuilt by the Goldsmith's Company of London, an infirmary, which is a very ornamental building, and a small theatre.

Stockport is one of the principal seats of the cotton manufacture. To the cotton manufacture, which is the staple of the town, may be added the manufacture of silk goods, thread, hats, brushes, spindles, and shuttles. There are several iron and brass foundries in the town, and a great number of bricks are made in the neighbourhood. The market is on Friday, and is the most important in Cheshire for corn, oatmeal, and cheese.

The municipal borough is divided into 6 wards, and is governed by 14 aldermen (of whom one is mayor) and 42 councillors. In 1841 the population of the township was 28,431. The parliamentary borough returns 2 members: population, 50,154.

STOCKS, in Horticulture, are young trees which are designed for the reception of the grafts or buds from other trees. The process by which a part of one tree is transferred to another is called grafting or budding [GRAFTING], and the object attained by it in gardening is the securing the continuance and multiplication of an individual plant that may possess peculiarities deemed worthy of preservation. It is by this process that the great number of varieties of cultivated fruits are preserved with remarkable integrity, and by which a constant improvement may be ensured.

Stocks are for practical purposes divided into three kinds: Crab Stocks, Free Stocks, and Dwarf Stocks. Crab Stocks are those which are grown from the seeds of wild and ungrafted trees, as the cherry, plum, apple, &c. These stocks are commonly used where a large and hardy growth is desirable. In the selection of wild stocks, those which grow cleanest, and are freest from irregularities of the stem and defects in the bark, should be chosen. Free Stocks are those which are raised from the seeds or layers of fruit and orchard trees which have been grafted. These stocks are found desirable when the object of grafting is to obtain choice varieties of apples, peaches, nectarines, apricots, or plums. Dwarf Stocks are those which are raised from low-growing shrubby trees. They are used in the grafting of low-standards for small gardens, also for wall-trees, and espaliers.

STOCKS, a wooden machine formerly much used for the punishment of disorderly persons by securing their legs. The time when they were first used in England does not appear; but they are mentioned in the second Statute of Labourers, 25 Edw. III. In 1376 the commons prayed the king for their establishment in every village.

In 'King Lear,' act ii., sc. 2, Shakspere has introduced the stocks upon the stage. Farmer, commenting upon the passage, says, 'It should be remembered that formerly in great houses, as still in some colleges, there were moveable stocks for the correction of the servants.' The last pair of stocks seen in London remained until a comparatively recent date in Portugal Street, Lincoln's-Inn-Fields. A whipping-post usually adjoined the stocks.

STOCKS, a term applied to the various Funds which constitute the National Debt. The interest on these Funds is paid half-yearly, and different descriptions of stock are paid at different quarters. The number of persons entitled to receive dividends on Oct. 10, 1847, and Jan. 5, 1848, was as follows:—

Div. not exceeding	Oct. 10, 1847.	Jan. 10, 1848.
£ 5 . .	51,609 . .	41,258
10 . .	25,274 . .	18,834
50 . .	54,145 . .	41,008
100 . .	13,087 . .	11,353
200 . .	6,889 . .	6,958
300 . .	1,917 . .	2,122
500 . .	1,203 . .	1,461
1000 . .	520 . .	689
2000 . .	163 . .	170
Exceeding 2000 . .	97 . .	82
	155,904	123,935

Each proprietor of stock may transfer his interest to others by sale. When the transfer is effected by a broker he must be authorised by a power of attorney from his principal. Few persons buy or sell stock except through the medium of a broker, but the general practice is to receive

their dividends themselves, or by a banker to whom a power of attorney is given. The purchaser acquires the dividend due upon the stock for the current half-year, and thus at one point there will be a sum of 29*s.* 4*d.* due on three-per-cent. stock, and a fortnight afterwards only 1*s.* 8*d.* On the bargain being completed, the parties repair to the Bank or South Sea House (according to the stock), where the actual transfer is effected.

Bargains in stock are transacted in the Stock Exchange, in Capel Court, Bartholomew Lane. All the more respectable brokers are members of the Stock Exchange, into which association they are elected annually by ballot. The established rate of brokerage is one-eighth per cent. (or 2*s.* 6*d.* in the 100*l.*) upon the amount of stock transferred. There is no stamp-duty or tax of any kind upon transfers of Government Stock; but the transfer of Bank Stock under 25*l.* costs 9*s.*, above that amount, 12*s.*; of South Sea Stock under 100*l.*, 10*s.*, above it, 12*s.*; and of India Stock of any amount, 1*l.* 12*s.*

The dividends on all descriptions of stock are due half-yearly, either on the 5th of January and 5th of July, or on the 5th of April and 10th of October, and are paid about a week afterwards; and for about six weeks previously, the books at the Transfer Office being closed, transfers cannot be regularly made. The transfers on each stock are effected at other times only on certain days in the week, which may be ascertained by a reference to any almanac.

The *Bargains for Time* form a very important portion of the business of the Stock Exchange. They are bargains to deliver stock on a certain day at a certain price, the seller of course believing that the price will fall, and the buyer that it will rise. When the period for completing the bargain has arrived, a settlement is usually effected without any payment of stock, the losing party simply paying the difference. Time Bargains cannot be enforced in a court of law, and the parties are held to them only by a sense of honour and self-interest, and the fear of exclusion from the Stock Exchange, which ruins their credit.

Stock of a high denomination may usually be bought cheaper than that of which the nominal interest is lower; and it is therefore the most advantageous for temporary investment. There is always a probability that the stock bearing the highest rate of interest will be reduced by the government when a favourable occasion presents itself; but the price of any one stock may be taken pretty nearly as an indication of the prices of the rest.

Besides these English funds, shares in many descriptions of foreign stocks, which have been created by loans raised in this country, are constantly for sale in the money-market, as are also shares in railway, canal, mining, and numerous other similar speculations.

STOCKTON-ON-TEES. [DURHAM.]

STOICS. [ZENO.]

STOKE-UPON-TRENT. [STAFFORDSHIRE.]

STOLE, originally a long vestment, a matron's robe, from the Latin *stola*, and that from the Greek στολή.

In later times stola was the term more particularly applied to a broad strip of cloth or stuff, with three crosses upon it, worn from the most primitive ages by priests of the Christian church, as a sacerdotal vestment, by whom it was also called *Orarium*.

That the word stole, in this sense, was of early adoption into the English language, appears from the 'Saxon Chronicle' under the year 963, when Archbishop Dunstan, at the time of personally confirming King Edgar's grant of lands to the monastery of Peterborough, added that he himself gave, among other vestments, his *stol* to St. Peter.

STOMACH. One of the most constant characters by which animals are distinguished is the possession of an internal digestive cavity, in which their food is received and subjected to a peculiar chemical change before it is appropriated to the nutrition of the different parts of the body. In some animals the change is effected in every part of the cavity; in others it goes on in one portion of it exclusively, and this portion is named the stomach. [DIGESTION.]

The human stomach is a membranous sac of an irregularly conical form, which lies almost transversely across the upper and left portion of the abdominal cavity. Its larger extremity is directed to the left, its smaller to the right. To the left it is in contact with the spleen; to the right, with the liver: above it is covered by the diaphragm, and, at about one-third of the distance from its left to its right extremity, it communicates by an orifice called the cardia, with the œsophagus: at its right end it opens by another orifice, named the pylorus, into the intestinal canal. Of these orifices the pyloric lies rather lower than the cardiac: they are separated from each other by the upper and shorter border, or small arch, of the stomach, the greater part of the cavity being formed as if by the dilatation of the left side of the œsophagus into a great cul-de-sac and great arch, which form the left and inferior boundary of the stomach.

The coats or walls of the stomach are composed of three distinct membranes, connected by a firm but very extensible cellular tissue. The external or peritoneal coat is a layer of fine compact cellular tissue, woven into a thin membrane, and covered by a fine cuticle or epithelium, from which like all the other organs within the abdominal cavity, it obtains a perfectly smooth and polished surface.

Between the peritoneal and the internal or mucous membrane, there is a stratum of loose cellular tissue, in which are inlaid the fibres of the middle or muscular coat. This is composed of three different sets of fibres, resembling in their structure those of most involuntary muscles.

The interior or mucous coat of the stomach is that in which the essential apparatus for the production of the digestive material is placed. To the naked eye it appears a soft spongy membrane, about one-tenth of an inch thick, with a polished slippery surface.

The more intimate structure of the mucous membrane can be seen only with the aid of the microscope. If its surface be examined with a

lens whose magnifying power multiplies diameters about forty times, it appears to be covered by minute polygonal fossæ, from $\frac{1}{100}$ to $\frac{1}{30}$ of an inch in width, surrounded by narrow sharp-edged borders, to which leaf-like processes are sometimes attached. At the bases of each of these fossæ there are, at least during digestion, from six to ten minute apertures leading into tubes which pass vertically into the substance of the mucous membrane. A thin section of the membrane made perpendicularly to its surface shows that nearly its whole substance is composed of these tubes, which are minute cylindrical glands, opening on the surface in the fossæ just described, but closed below, and set compactly side by side in groups. The small blood-vessels pass vertically in the cellular tissue between the groups of tubules from the submucous tissue to the surface of the stomach, on which they form an angular network, marking out the borders of the shallow fossæ. The office of these tubules seems to be the production of cells containing the fluid for digestion. These cells are of an oval form, about $\frac{1}{250}$ of an inch in length; and, as fast as they are produced, they are pushed towards the orifices of the tubes, from which, while digestion is going on, they are discharged in such numbers as to form, with a small quantity of fluid separated at the same time, the thick layer of mucus by which the whole interior of the stomach is lined, and by which the portions of food are invested.

During digestion there are also often found, just beneath the surface of the mucous membrane, around either the cardiac or pyloric orifice, and along the lesser arch of the stomach, a number of small closed sacculi, filled with an opaque white fluid containing cells, which, when their contents are matured, burst and discharge them into the interior of the stomach.

The distinctive character of the fluid contained in the cells formed by the tubular gastric glands is, that it holds in solution a peculiar chemical principle, to which the name of Pepsin has been given, and which in conjunction with a small quantity of acetic or muriatic acid constitutes the true gastric juice or digestive fluid. It may be extracted from the mucous membrane of the stomach after death, and if a slightly acidulated solution of it be mixed with food, the latter will pass through the same changes as are produced by digestion in the living stomach or in the gastric fluid obtained during life, and will be at last converted into chyme.

STOMAPODS. M. Milne Edwards comprises in the order *Stomapodes* all the Podophthalmous Crustaceans which are deprived of thoracic branchiæ lodged in internal cavities.

This division is entirely composed of swimming crustaceans, whose body is elongated, and whose general form often approaches closely to that of the macrourous decapods; but in those animals the concentration of the rings of the head and thorax is carried less far. In the greater part of the Stomapods the ophthalmic and antennular rings are not confounded with the rest of the head, and they even sometimes acquire a remarkable development. As in the other *Podophthalma*, there always exists a carapace, which is formed by the enlargement of the dorsal arch of the antennary or mandibular rings; but the dimensions and form of this buckler vary greatly. The thorax is generally elongated, and entirely composed of segments moveable upon each other. Sometimes all the rings of this part of the body are united into a single piece. The conformation of the abdomen varies still more; this portion of the body presents in general nearly the same disposition as in the macrourous decapods, and terminates by a great caudal fin composed of appendages of the sixth ring and the following segment; but in some stomapods the abdomen is rudimentary. The disposition of the limbs is equally variable. The eyes are always carried on a first pair of moveable appendages, the length of which is often very considerable, and whose disposition is essentially the same as in the macrourous decapods. The first pair of antennæ are rather long, and terminate in two or three multiarticulate filaments; the peduncles are always cylindrical, and can never be bent back under the front as in the brachyurous decapods. They are inserted below the eyes, near the median line, or externally to the base of those organs. The second pair of antennæ vary still more; their conformation however generally approaches that in the shrimps. [SHRIMPS.]

There are generally seven or eight pairs of feet, often presenting the same mode of conformation. They are nearly always provided with an appendage, which may be considered as the analogue of a palp. There is often found also at the base of many of the anterior feet another soft and vesicular appendage, which has sometimes the form of a galette, and which represents the flagrum, an organ which, in the greater portion of the decapods, is lamellar and of a horny consistence; but which, in certain shrimps, presents a structure similar to that in the stomapods. Three of the last pairs, or a greater number, are always natatory; the first pair, or even the first four, are often prehensile; but they never terminate in a didactylous pincer, as in the decapods.

The branchiæ of the stomapods are always external, and present in general a more complicated structure than those of the decapods. Instead of being composed of lamellæ or simple filaments, they are framed of cylinders ranged in parallel order, giving origin to other smaller cylinders, which, in their turn, are equally fringed. Sometimes these ramose branchiæ are fixed at the base of the thoracic feet, and suspended under the thorax; but in general they spring from the basilary joint of the abdominal false feet: in some of the order they are reduced to a rudimentary state; in others nothing is to be seen which can be considered as a special organ of respiration; and, in such cases, there is every reason to believe that this function is exercised by the general surface of the teguments.

M. Milne Edwards divides the stomapods, after the example of Latreille into three families: the *Caridoides, the Bicuirassés*, and the *Unicuirassés*.

The *Caridoïd* Stomapods are subdivided into two tribes, the *Mysians*, and the *Luciferians*.

To the first tribe belong the genera *Mysis*, *Cynthia*, and *Thysanopoda*. To the *Luciferians* belongs the genus *Lucifer*.

The *Bicuirassed Stomapods* embrace the groups *Phyllosoma* and *Amphion*.

The *Unicuirassed Stomapods* are subdivided into two tribes, the *Ericthians*, and *Squillians*. The *Ericthians* are represented by the genera *Squillericthus*, *Ericthus*, and *Alima*. The *Squillians* embrace the genera *Squilla*, *Gonodactylus*, and *Coronis*.

For an admirable account of the organisation and habits of the *Opossum Shrimps* (*Mysis*), so called from the circumstance of the females possessing a pouch for the reception of the eggs, or rather embryos after exclusion from the ovarium, we must refer to Mr. Thompson's 'Zoological Researches.' The details given in this work are very valuable for the insight afforded into some of the most curious and obscure phenomena manifested by the *Crustacea* generally. The student will no doubt be led to compare the development of the young *Opossum Shrimps* with that of the quadrupedal MARSUPIALIA.

(See also M. Milne Edwards's *Histoire Naturelle des Crustacées—Suites à Buffon*, Paris, 1834.)

STOMATES (from the Greek στόμα, an 'opening,' or 'mouth'), in botany, are small longitudinal openings occurring in the epidermis of plants, and usually bounded by two or more lunate or kidney-shaped vesicles. The epidermis of plants has been described by Bronguiart and others as consisting of three parts, which may be easily demonstrated by a lengthened maceration. The outermost of these consists of an extremely delicate homogeneous pellicle, which does not present any decided marks of organisation, and is perforated in places where the stomates exist. The second part consists of a single layer, sometimes of more than one, of flattened vesicles of cellular tissue. These vesicles are very small, and of various figures, but the most frequent form is the hexagonal. The third part of the epidermis is the stomates, which are placed under the above-mentioned pellicle and on the same plane with the layer of flattened vesicles.

The structure of the stomates is best seen in the monocotyledonous plants, in which they generally occur of a larger size. They are quite imperceptible to the naked eye, but may be discovered by a lens of low power. In general they will be found to consist of two kidney-shaped bodies, which are merely cells of cellular tissue filled with a green matter, and from this circumstance contrast with the transparent cuticle in which they are placed. The kidney-shaped bodies lie with their incurved edges presented to each other, and their extremities unite with each other so that they leave between them a little oval chink or opening. This opening communicates with the parenchyma of the leaf or other organ underneath the cuticle, and at this point the cellular tissue is loose, and frequently a large cavity is observed, into which the stomate opens.

The stomates are mostly arranged irregularly upon the surface of the epidermis, occupying generally about equal distances from each other. There are however some remarkable exceptions. In the Grasses, for instance, and some other monocotyledonous plants, the stomates are arranged in regular rows, which run parallel with the bundles of woody tissue which enter into the composition of the leaf. In *Phormium tenax* and in *Pinus* the stomates are also arranged in a longitudinal series. In *Begonia spathulata* the stomates on the under surface of the leaves are collected together in the form of little rosettes. The same is seen in *Crassula cordata* and *arborescens*.

Stomates are found on plants whenever there is a distinct epidermis, and they exist on nearly all the parts of a plant exposed to the light. In the lower cryptogamic plants, as mosses, fungi, lichens, and algæ, they have never been found.

Stomates are not always present on both surfaces of the leaves. They are however much more frequently absent on the upper than on the under surface of the leaf.

The number of stomates contained in a given surface varies very much in different species and families of plants. Many observers have occupied themselves in counting them. *Citrus Aurantium* was found to have 409,824 stomates on a square inch, and *Solanum sanctum* 448,704. *Viscum album* had only 200.

The different names that have been given to the stomates by various writers will at once indicate the differences of opinion that have existed with regard to their functions. It was an early opinion that they were excretory glands, and that through their agency the bloom that exists on the leaves, &c., of many plants was formed.

Bonnet found that leaves when flagging were restored by placing one of their surfaces in water, and hence he concluded that one of the functions of the stomates was to absorb moisture from the atmosphere, but the hygroscopicity of vegetable tissue would account for this absorption, and would effect it when necessary without having recourse to the supposition that a special organ was provided for it.

That they are organs by which the process of exhalation is carried on as a vital process, there is much reason to suppose. They exist in the greatest abundance in those parts of plants in which this operation is going on; they are also most abundant in membranous leaves, which are known to exhale most, and are deficient in succulent leaves, in which there is little exhalation.

STO'MIAS, a genus of fishes of the Pike tribe (family *Esocidæ*), of which two species are known, both inhabitants of the Mediterranean. The genus *Chauliodus* appears to be closely allied to the present fishes, which are very singular in colouring, and in many structural details. (Cuvier, 'Règne Anim.' vol. ii., p. 283).

STONE FOR BUILDING. The durability of stone may be examined in several ways, and results of much importance in the arts have been obtained by some investigations which were set on foot for the purpose of determining on a proper stone with which to construct the New Palace of Westminster.

Stone fit for building must in general be freestone firm enough to sustain great pressure, and

yet so aggregated as to admit of being worked with facility by ordinary tools, and of receiving correct surfaces in any direction. It must in general yield masses of great dimensions. Its colour is of consequence to the architect, who is necessarily attentive to this element of effect: and the colour which belongs to the stone is very often, indeed generally, modified in buildings by the growth of lichen, the access of moisture, and the change of oxidation of the contained iron. By so many conditions, indeed, is the choice of stone limited in a particular case, that very few samples can be really placed in competition.

In the great variety of limestones and sandstones which are adapted for building purposes, we remark, by the aid of the microscope, three principal modes of molecular aggregation: mixtures of grains; segregated concretions of grains; and compacted crystallisations. Mixtures of very unequal or very dissimilar parts, as millstone-grit; concretions which have earthy textures in their interstices, as some oolitic limestones; crystallisations which do not produce compactness, as in some magnesian limestones,—are not in general durable. But equal mixtures, as the Sarsen sandstone, the Craigleith sandstone, and some mountain limestones; concretions of adherent globules, as the oolite of Ketton; concretions of globules cemented by sparry interstices, as the oolite of Ancaster; and crystallisations with uniformly adherent grains, as in the magnesian limestone of Bolsover,—these appear to be durable.

The commissioners (Mr. Barry, Sir H. De la Beche, and Dr. W. Smith) who reported on the choice of stone for the construction of the New Houses of Parliament, made valuable experiments as to the hardness, closeness, density, colour, and durability of many varieties of stone. The strength of several sorts of stone, as measured by the weight necessary to be applied for breaking and crushing them, appears below:—

	Resistance to fracture.	Resistance to crushing.	Name of Stone.
Sandstones	60	111	Craigleith.
	88	106	Darley Dale.
	56	107	Park Spring.
	48	70	Kenton.
	38	71	Binnie.
Oolites	50	127	Ketton Rag.
	30	55	Portland.
	22	57	Hamhill.
	24	33	Ancaster.
	16	25	Barnack.
	18	21	Box.
Limestones	70	117	Bolsover.
	36	74	Mansfield.
	34	61	Huddlestone.
	24	55	Roche.
	20	23	Cadeby.

Of sixteen specimens selected, the stone most absorbent of water was proved to be the Bath oolite from Box; that most injured by Brard's artificial process of disintegration was the Barnack stone: and that which was most easily crushed was the Bath oolite from Box. Generally speaking, sandstones were least absorbent, magnesian limestones least disintegrating; sandstones appeared to be strongest, though choice magnesian limestones (as that of Bolsover, finally recommended by the Commissioners) were fully equal in this respect, and were almost as little absorbent. ('Report of the Commissioners,' 1839.)

Stones of uniform texture commonly decay by disintegration at the surface, losing grain by grain in proportion to time and exposure. Stones composed of parts unequally mixed suffer unequal waste in different parts. Shells, corals, concretions, and crystallised masses, thus appear prominent from earthy limestones, and indicate the general fact that, in proportion to the force of molecular aggregation in the stone, is the resistance which it offers to decay. It is not the amount but the kind of exposure which governs the decay of stone: the southern and western parts of our cathedrals give way more than the northern and eastern.

STONE. [CALCULUS.]

STONE, EDMUND, a mathematician of North Britain. He was of humble origin, having been the son of a gardener in the service of the duke of Argyle. A servant of the family taught him, when a boy, to read; and with no other guide than his own genius, he at length became learned in the higher branches of mathematical science.

Mr. Stone published, in 1723, a translation of Bion's 'Treatise on Mathematical Instruments;' in 1726 a 'Mathematical Dictionary;' in 1 vol. 8vo.; and in 1730 a translation of the Marquis de l'Hôpital's 'Analyse des Infiniment Petits,' together with a treatise by himself on the 'Method of Fluents, or the Inverse Method of Fluxions.' In the following year he published 'The Elements of Euclid,' in 2 vols. 8vo., and in 1735 a translation from the Latin, of Dr. Barrow's 'Geometrical Lectures.' He was elected a fellow of the Royal Society in 1725.

It is not known from what circumstance Mr. Stone lost the support of the noble family which had patronised him, but it appears that in the latter part of his life he subsisted by giving lessons in mathematics, and that he died in poverty in 1768.

STONE, NICHOLAS, was born at Woodsbury, near Exeter, in 1586. He lived three years in London with one Isaac Jones, his master, and then went to Holland, where he worked for Peter de Reyser, whose daughter he married. He returned to England about 1614, and was for many years chiefly employed in making monuments for the nobility and gentry. In 1619 he was appointed master-mason for building the new Banqueting House of Whitehall, on which he was engaged two years, at 4*s.* 10*d.* per day; and in 1626 he was appointed master-mason of Windsor Castle. He made several monuments for Westminster Abbey; among them one to Spenser, the poet, for which the Countess of Dorset paid him 40*l.*

Stone received altogether nearly 11,000*l.* for the various monuments erected by him. He died Aug. 24, 1647. Stone had three sons, Henry, Nicholas, and John.

Henry Stone, known as *Old Stone*, probably because he was the eldest, was a statuary and painter. He studied in Italy and the Nether-

lands, and made many excellent copies of celebrated Italian and Flemish pictures. There is a large copy at Hampton Court of the celebrated picture, by Titian, of the Cornaro Family, now in the possession of the Duke of Northumberland. He died Aug. 27, 1653.

Nicholas Stone, the second son, who was a statuary, also studied abroad, and modelled many excellent copies of celebrated works. Mr. Bird, the statuary, says Walpole, had the 'Laocoon' and Bernini's 'Apollo and Daphne' in terracotta by him. He returned to England in 1642, and died in the same year as his father.

John Stone, the youngest, was also a statuary, though he was originally designed for the church, and was educated at Oxford. In the civil war he entered the King's army, and narrowly escaped being taken. He contrived to escape to France, where he probably took to the arts, as he was afterwards engaged in partnership with his brother Henry. He died soon after the Restoration.

STONECHATS. [WARBLERS.]

STONEHAVEN. [KINCARDINESHIRE.]

STONEHENGE. [WILTSHIRE.]

STONEHOUSE. [DEVONSHIRE.]

STONHOUSE, SIR JAMES, was born July 20, 1716, at Tubney, near Abingdon. He was educated at Winchester School, and afterwards at St. John's College, Oxford. He took his degree of M.A. in 1739, that of M.B. in 1742, and that of M.D. in 1745. He attended St. Thomas's Hospital for two years under Sir Edward Wilmot, Dr. Hall, and Dr. Letherland, and carried on his medical studies for two years more at Paris, Lyon, Montpellier, and Marseille. After his return he practised with great success for more than twenty years at Coventry and Northampton, and then quitted his profession; took orders; and was ordained deacon in Hereford Cathedral, and priest the week after in Bristol Cathedral. In May, 1764, he was presented to the living of Little Chevrel, and in December, 1779, to that of Great Chevrel, where he applied himself to the duties of his station with assiduity, and became popular as a preacher. He died at Bristol-Wells, Dec. 8, 1795. Much of Sir James Stonhouse's general character and conduct, his sentiments, and the vicissitudes of his professional employment, may be learned from his correspondence, published in 1805, 2 vols. 12mo., with the title of 'Letters from the Rev. Job Orton and the Rev. Sir James Stonhouse,' &c.

STONY STRATFORD. [BUCKINGHAMSHIRE.]

STOP. [ORGAN.]

STOP-COCK. [COCK.]

STOPPAGE IN TRANSITU is the seizure by the seller of goods sold on credit during the course of their passage (transitus) to the buyer. This principle is said to have been established about 1690 in the Court of Chancery (2 Vern., 203); and it has since been acknowledged in the courts of common law. The transitus is defined to be the passage of the goods to the place agreed upon by the buyer and seller or the place at which they are to come into the possession of the buyer. Goods are in transitu while they are at rest, if they are still on the road to the place to which they have been sent. This doctrine of stoppage in transitu entitles a seller, in case of the insolvency or bankruptcy of the buyer, to stop the goods before they come into the buyer's possession. A factor either at home or abroad, if he consigns goods to his principal by the order of the principal and has got the goods in his own name or on his own credit, has the same right of stoppage in transitu as if he were the seller. Questions of stoppage in transitu sometimes involve difficult points of law.

STORACE, STEPHEN, was born in London, in 1763. His father, a Neapolitan, played the double-base at Drury Lane Theatre.

When about twelve years old, Stephen was placed by his father in the Conservatorio St. Onofrio, at Naples. After completing his musical studies, he visited different cities of Italy, accompanied by his sister Anna, who was at once recognised as a first-rate vocalist. They then proceeded to Vienna, where Signora Storace was engaged at the emperor's Italian theatre, and her brother composed for the same an opera, 'Gl' Equivoci,' the substance borrowed from Shakspere's 'Comedy of Errors.' Portions of the music he afterwards used in his 'Pirates,' and in 'No Song, no Supper.'

In March, 1787, Storace and his sister returned to England, and were engaged at the King's Theatre, the lady as singer, and her brother as director of the music. Her success was decided, but the intrigues of the Italian performers were too harassing for his sensitive nature, and he withdrew to Bath. In 1789 he produced his first opera at Drury Lane, 'The Haunted Tower,' his sister appearing in the principal character, and the opera was very successful. In 1790 he brought out 'No Song, no Supper,' written by Prince Hoare. In 1791 appeared the 'Siege of Belgrade,' altered by Cobb from 'La Cosa Rara,' in which much of Martini's music is mixed up with Storace's. 'The Pirates' was given, for the first time, in Nov. 1792. 'The Prize' was brought out in 1793; 'Lodoiska,' some of the music of which was by Storace, in 1794; and the same year also produced 'The Iron Chest,' by George Colman, the younger, the incidental music by Storace. The composer's attendance on the first rehearsal of this, while under the influence of a severe attack of gout, cost him his life. He died March 19, 1794.

At the time of his death he had in preparation a new opera, 'Mahmoud,' which was completed by the assistance of Signora Storace and friends, and was performed with much success on the 30th of the month in which he died.

STORAX. [STYRAX.]

STORK. [HERONS.]

STORK, ABRAHAM. This eminent marine painter, of whose birth and instruction nothing is known, was equally successful in representing ships, either at sea or at anchor in port, either in calms or in storms. His most celebrated picture is that representing the reception of the Duke of Marlborough in the river Amstel. His colouring is agreeable; his touch light, firm, and spirited; and his figures, though small, are designed with the utmost correctness. He died at Amsterdam, the place of his nativity, in 1708.

STORNAWAY. [Ross and Cromarty.]

STORY, JOSEPH, was born on the 18th Sept., 1779, at Marblehead, in the State of Massachusetts, U. S. He received the rudiments of learning in his native town; entered Harvard University in 1795, and took a degree there in 1798. In 1801 he was called to the bar, and speedily obtained extensive practice. In 1805 he became a member of the legislature of Massachusetts, and he continued a representative till he was made a judge. In 1809 he was chosen a member of Congress, as representative of the Essex South District. He acquired a high reputation as a politician and a forensic debater. In November, 1811, he was appointed an Associate Justice of the Supreme Court of the United States. The jurisdiction of this court, both original and appellate, embraces a very great variety of subjects; and Story was thus led to consider the complicated questions of international law. The result of his practical experience was his 'Commentaries on the Conflicts of Laws,' published in 1834, which gained him a reputation in Europe. In 1830 he was appointed to the newly-founded chair of jurisprudence in Harvard University; and during the time that he held this professorship he wrote his numerous legal treatises: on the law of Agency; on the law of Partnership; on the law of Bills of Exchange; on the law of Bailments; on Equity Jurisprudence; and on Equity Pleadings. The last is founded on Mitford's work, and in fact large portions of Mitford's treatise are incorporated in Story's book. The merits of Justice Story are great, but his works are characterised by that diffuseness, and sometimes by that want of sound jurisprudential principles, which are apparent in all the law treatises written in the English language. He died Sept. 10, 1845.

STOTHARD, THOMAS, the son of a publican, was born in Long Acre, London, Aug. 17, 1755. Evincing at a very early age a taste for drawing, he was apprenticed to a pattern-drawer for brocaded silks. His first efforts in a higher branch of art were designs for the 'Town and Country Magazine,' published by Harrison, in Paternoster Row; and soon after he gained high repute by his compositions for Bell's 'British Poets,' and the 'Novelist's Magazine.' During this period he diligently studied at the Royal Academy. The first picture that he exhibited at that institution was the subject of Ajax defending the body of Patroclus. He was elected an associate of the Royal Academy in 1785, and Royal Academician in 1794. Among the more important of his works may be enumerated his designs for Boydell's Shakspere, his Canterbury Pilgrims, the Flitch of Bacon, and the Wellington Shield. His largest performance is the fresco painting of the staircase at Burleigh, the seat of the marquis of Exeter. He also designed the ceiling of the Advocates' Library at Edinburgh. He died April 27, 1834, at his house in Newman Street, London.

STOTHARD, CHARLES ALFRED, a son of the preceding, was born in London, July 5, 1786. In 1807 he was admitted as a student of the Royal Academy. In 1810 he executed his first historical picture, 'The Death of Richard II. in Pomfret Castle.' The preparatory study which he had undergone with a view to this composition, and in order to improve his general knowledge of costume, now suggested to him the idea of a work on the monumental effigies of Great Britain, of which the first number appeared in June, 1811. Its success was complete, and established the reputation of the author both as an antiquarian and an artist. In successive years he occupied himself in making excursions in search of monumental antiquities; and during the summer of 1815 he proceeded so far northward as the Picts' Wall to make drawings for Lysons's 'Magna Britannia.' In the same year he was appointed historical draughtsman to the Society of Antiquaries; and in 1816 was deputed by that body to make drawings from the tapestry at Bayeux. While in France he made some valuable and interesting discoveries of monumental effigies at Fontevraud, and elsewhere. In 1817 he made a second, and, in 1818, a third journey to Bayeux. In 1819 he laid before the Society of Antiquaries the complete series of drawings from the Bayeux Tapestry, together with a paper, in which he proved that the tapestry was a work coeval with the Norman invasion. The paper was printed in the nineteenth volume of the 'Archæologia,' and Mr. Stothard was elected a Fellow. In 1820 he travelled in the Netherlands, and on his return published the ninth number of his 'Monumental Effigies.' Early in 1821 he prepared a tenth number for publication, and also finished a large plate of the Royal Effigies at Fontevraud. He also began a work on Seals. Another of his numerous undertakings was a work illustrative of the age of Queen Elizabeth. In May, 1821, he left London for Devonshire, for the purpose of making drawings for the Rev. D. Lysons's account of that county. He went to Beer-Ferrers, and while tracing the portrait of Sir William Ferrers in the east window of the church, one of the steps of the ladder on which he stood broke, and he was thrown with such violence against a monument, that he was killed on the spot, May 27, 1821.

STOUR. [Dorsetshire; Essex; Kent.]

STOURBRIDGE. [Worcestershire.]

STOURPORT. [Worcestershire.]

STOVE. [Hothouse; Warming and Ventilation.]

STOW, JOHN, was born in London, about 1525. His father belonged to the Company of Merchant Tailors, and the son in the early part of his life followed the trade of a tailor. He had probably from early life had a taste for the investigation of the national antiquities; but about his fortieth year, as we learn from himself, he left his business and applied himself altogether to his favourite study.

The accounts that have been given of Stow's publications are for the most part very defective, confused, and contradictory. It does not appear that there are really more than two historical works of Stow's, his 'Summary' and his 'Annals,' and one topographical work, his 'Survey of London.'

The earliest edition of the 'Summary' that we have seen is a very small 18mo. volume, in

black letter, entitled 'The Summarie of Englishe Chronicles (lately collected and published), abridged and continued till this present Moneth of November, in the Yeare of our Lord God 1567, by J. S.; imprinted at London, in Flete Street, nere to S. Dunstone's Church, by Thomas Marshe.' But this is not the first edition of the book, as is stated by the author in a dedication to the lord-mayor, aldermen, and commoners of London. Stow's 'Summary' seems to have been in constant demand for half a century after its first publication; it was the popular manual of our national history; hence the book was laid hold of by the Stationers' Company, who probably brought out new impressions of it every three or four years, continued to the date of publication like their almanacks and other similar handbooks.

The 'Annals' appear to have been first printed in 4to. and in black letter, in 1592, to which year the history is brought down. Another edition also in 4to. and black letter, is entitled 'The Annales of England; faithfully collected out of the most authenticall authors, records, and other monuments of antiquity; lately collected, since increased, and continued from the first habitation untill this present year 1606; by John Stow, Citizen of London. Imprinted at London for George Bishop and Thomas Adams.'

Stow's other work, his 'Survey of London,' was first published, in a quarto volume, in 1598; and has been frequently reprinted, with additions. Stow, in various passages of his 'Annals,' claims the continuation of Holinshed's 'Chronicle' from 1576 to 1586, as his own handiwork. He appears to have at least supplied a great part of the materials for that portion of the work.

The hard fate of Stow in his old age is well known. The laborious and acute investigator of antiquity, and faithful and graphic depictor of the manners and customs of his own time, was left by his countrymen, when he had reached his eightieth year, literally to beg his bread. Strype has given a letter from James I., referring to letters patent under the great seal, granted 8th of May, 1603, authorising Stow, in consideration of his public services, to collect the voluntary contributions of the people throughout the greater part of the kingdom. He died April 5, 1605.

STOW-ON-THE-WOLD. [GLOUCESTERSHIRE.]

STOWELL, WILLIAM SCOTT, BARON, was the elder brother of Lord Chancellor Eldon, and the eldest son of Mr. William Scott, of Newcastle. He was born Oct. 17, 1745 (O.S.), at Heworth, in the county of Durham.

William was educated with his two younger brothers, Henry and John, at the Royal Grammar-school of Newcastle. William was sent to Corpus Christi College, Oxford, in 1761. In 1764 he was elected a probationary fellow of University College, to which he was eligible as being a native of the county of Durham; and he succeeded William (afterwards Sir William) Jones as college tutor. In 1772 he took his degree of B.C.L., having determined on following the profession of an advocate at Doctors' Commons. He was already a member of the Middle Temple, London.

In 1774 he was elected Camden Reader of Ancient History, in which capacity he delivered lectures to a crowded audience. Stowell resided at Oxford until 1779, where he took his degree of D.C.L., as grand compounder, which means that he paid the higher fees exacted from graduates worth 300*l.* a year. He had, no doubt, saved money during the twelve years of his tutorship, and he had also succeeded to considerable property from his father, who died in 1776.

Dr. Scott was called to the bar in 1780. His talents and learning, and the reputation he had brought from the university, soon brought him a large practice in his profession. His success as an advocate in no long time led to promotion. In 1783 he was appointed to the office of Registrar of the Court of Faculties. In 1788 the Bishop of London appointed him Judge of the Consistory Court; and the Archbishop of Canterbury, his Vicar-General, or Official Principal. In the same year he was made Advocate-General, and knighted, and was also nominated a Privy Councillor. In 1790 he was nominated by the archbishop Master of the Faculties. Finally, in 1798, he was made Judge of the High Court of Admiralty. In 1801 he obtained the great object of his ambition by being elected member for the university of Oxford, and he retained his seat as long as he was a commoner.

He was made a peer in 1821, being created Baron Stowell, of Stowell Park. He retained his place on the bench till Christmas, 1828. For the last two years of his life he was reduced to a state of mental imbecility; and he died at his seat of Early Court, Berkshire, after an illness of a few days, Jan. 28, 1836, in his 91st year. By his first wife Lord Stowell, besides a daughter (who became the wife, first, of Thomas Townshend, Esq., secondly, of the late Viscount Sidmouth), had a son, William, who died about two months before his father.

Lord Stowell is the highest English authority in his own department of the law, including both ecclesiastical law and the law of nations. His judgments in the Consistory Court have been reported by Drs. Haggard and Phillimore; those delivered by him in the Court of Admiralty, in part with the advantages of his own revision, by Drs. Robinson, Edwards, Dodson, and Haggard. Their characteristics are the most complete mastery of all the learning of his subject, great comprehensiveness of view, a penetrating sagacity in the disentanglement of the essential points and governing principle of a case from the confusion and sometimes apparent contradiction of details and accessory circumstances, a remarkable faculty of luminous and striking illustration, and all this combined and set off with a diction generally of much precision, elegance, and expressiveness, though somewhat diffuse and rhetorical. Lord Stowell, like his brother Lord Eldon, was opposed to all change. He was a sort of representative of the clergy, both in his quality of member of the university of Oxford, and in his office as an ecclesiastical judge. He was a man of ability, according to the measure of the times in which he lived, and one who knew how to get out of the existing condition of things the utmost possible profit for himself.

STRABISMUS. [SQUINTING.]

STRABO was born at Amasia, in Cappadocia, before the Christian æra. The time of his birth is uncertain, but it may have been between 70 and 60 B.C. His mother was the granddaughter of Lágetas, who was one of the two sons of Dorylæus, a skilful commander who had been employed by Mithridates Euérgetes. Moaphernes, who had been employed by Mithridates Eúpator, was an uncle of Strabo's mother by the father's side. We are not informed who his father was. His name, Strabo, is the cognomen of Pompeius Strabo, the father of Pompeius the Great, whence it has been conjectured that on his father's side there was some connection with the family of Pompeius. Strabo, the son, received a good education. He also travelled in many parts of Europe and Asia. Syria, Palestine, and Egypt, as far as the cataracts of Syéne, were within the range of his travels. In Egypt (B.C. 24) he became acquainted with Ælius Gallus, who commanded a Roman expedition into Arabia, in the time of Augustus. He was personally acquainted with Italy, and he tells us that Elba, Corsica, and Sardinia are visible from the heights of Populonium, from which it is a probable conclusion that he had seen those places from the Italian coast. He also spent some time at Rome.

There are various passages in his 'Geography' which indicate about what time they were written. In his sixth book (p. 288, ed. Cas.) he speaks of Germanicus and Drusus as still living; and in the thirteenth (p. 627) he speaks of Tiberius as the reigning emperor, and as having repaired the mischief done to Sardis by the great earthquake, A.D. 17. There are numerous other passages in this work in which he speaks of contemporary historical events. In a passage of the fourth book (p. 206) he says that it was then the thirty-third year since the Nórici had been reduced to obedience by Tiberius and Drusus, which took place about B.C. 15; according to which Strabo was writing his fourth book in the year A.D. 18. In a passage of the seventeenth and last book he speaks of the death of Juba, as a recent occurrence, and Juba died in A.D. 21.

Very different opinions have been given of Strabo's geographical work. That he was deficient in mathematical knowledge is evident, and his accuracy in many cases is at least doubtful. To form a proper judgment of him we must ascertain what he proposed his work to be, which may be collected from various passages. His work was to be practical, that is, adapted to the use of persons of a certain amount of education, and particularly personages engaged in administration. He says that a 'man who reads his work ought not to be so ignorant as never to have seen a sphere or the circles marked on it.' 'His work,' he says, 'is, in a word, for universal use, political and profitable to all, just as history is' (pp. 12, 13); and 'as he had written an historical work (ὑπομνήματα ἱστορικά), useful as he supposed, both for ethical and political philosophy, he determined to add to it a geographical work, which was of a like kind, and addressed to the same class of men, and chiefly to those in power; and, as in the former work, only what related to distinguished men and to distinguished lives was recorded, and things trivial and mean were omitted; so in his geographical work he should dwell only on things which were of note and of importance, and things in which there was something useful for example, and worth recording and agreeable.' Strabo neither designed a mathematical treatise, nor an enumeration of astronomical positions, nor a treatise on the physical character of countries. His design was to write something which should give an educated man a general notion of the earth's surface, its political divisions, the chief peculiarities of each, and so much of its history as would enliven and explain his geographical description.

Accordingly Strabo produced a work which contains a great mass of useful information, but it is not strictly a geographical work, and though systematic according to his notion of system, it does not deserve the name of a system of geography. Though he resided some time at Alexandria, he derived little advantage from the labours of the geographers and astronomers of that school for the correction of positions and fixing the bearings of places with respect to one another, or for determining the general form of the regions which he describes. His taste indeed was for other studies than those which belong to the geographer.

Strabo's work is in seventeen books. The first two books contain his general geography, and his criticism of those geographers who preceded him. The remaining fifteen books treat of Europe, Asia, and Libya (Africa). Fourteen books are appropriated to Europe and Asia; and the seventeenth to Libya. Part of the seventh book is lost, and its place is supplied by a meagre epitome.

The first edition of Strabo was a Latin version, published in 1472; and the first edition of the Greek text was published by Aldus at Venice, in 1516, folio. One of the most useful of the older editions is that of Isaac Casaubon, Geneva, 1587, folio, and reprinted at Paris in 1620. A critical edition by the learned Greek Adamantios Koray appeared at Paris, 1815–1818, 4 vols. 8vo. Two volumes at least of a new edition by Gustavus Kramer have been published (Berlin, 1844 and 1847). A French translation of Strabo appeared at Paris, 1805–1819, in five quarto volumes, with copious notes. The best translation of Strabo is the German version, by C. J. Groskurd, 3 vols. 8vo., Berlin and Stettin, 1831–1833.

STRADA, FAMIA'NO, born at Rome in 1572, entered the order of the Jesuits, and became professor of rhetoric in the Gregorian College at Rome, where he died in 1649. He wrote 'Prolusiones,' or Latin essays, upon rhetoric and literature, which were admired at the time. But the work for which Strada is remembered is entitled 'De Bello Belgico ab Excessu Caroli V. ad Annum 1590,' being a history of the revolt and war of the Netherlands against Spain, which he wrote in Latin, about the same time as his contemporary Bentivoglio wrote the history of the same war in Italian. Strada brought his narrative down to 1590, and the work was continued by two other

Jesuits, fathers Dondini and Galluzzi, who wrote the sequel as far as 1609: their compositions however are very inferior to Strada's in style.

STRADA, or STRADA'NUS, JOHN, was born in 1536 at Bruges, where he studied the art of painting. At Naples and other cities of Italy to which he was invited he executed many considerable works in fresco and in oil; but he fixed his residence in Florence, in which city there are some fine performances of his; the most celebrated is his Crucifixion, which is a grand composition, with numerous figures larger than life, and near the cross are the Virgin, St. John, and Mary Magdalen.

Though he chiefly painted from sacred history, he was fond of painting animals, hunting parties, and sometimes battles, all of which he executed with great spirit. The statements of authors respecting the birth and death of Strada are contradictory. Sandrart says that he was born in 1536, and died in 1604. This is probably correct.

STRADBALLY. [QUEEN'S COUNTY.]

STRADELLA, ALESSANDRO, was born at Naples about the middle of the 17th century. His works are chiefly of a miscellaneous kind, consisting of airs, duets, cantatas, madrigals, &c. One oratorio and one opera comprise the whole of his dramatic compositions that Dr. Burney's diligent search enabled him to discover. The former—'San Giovanni Batista'—is highly extolled by the musical historian. It seems to be agreed that the study of his works contributed largely in forming the taste of many great composers,—of our own Purcell, of Clari, Steffani, A. Scarlatti, and Pergolesi, and this alone is sufficient to bestow on him a lasting reputation.

The personal history of Stradella is romantic. At Venice he was engaged by a nobleman to instruct his mistress, a young lady, who is said to have been of high birth. After a time the pleasing manners and accomplishments of her teacher raised a new flame in her bosom. The passion was mutual, the lovers were married, and fled to Rome, whither they were pursued by two assassins, engaged by the Venetian to avenge the injury his pride had sustained. They found the happy couple in the church of San Giovanni Laterano, and they determined to carry their design into execution at the conclusion of the sacred service. But while waiting, they heard the musician sing, and were so overcome by the charms of his voice, that, confessing to him what had been their object, they declared their determination to abandon it. The intended victims retired to Turin. There they were pursued by two other hired murderers, and though lodged in the palace of the Duchess of Savoy, Stradella received three stabs in his breast. The wounds however did not prove mortal, and as a year elapsed after the recovery of the sufferer, and no fresh attempt on his life was made, he considered himself secure for the future. Stradella accepted an engagement at Genoa, to compose an opera, whither he went with his wife. Their enemy followed them by the agents of his unrelenting revenge, who stabbed both of them to the heart. This event Walther, in his Lexicon, fixes in the year 1670: but Dr. Burney shows that it must have occurred some years later.

STRAFFORD, THOMAS WENTWORTH, EARL OF, was born in Chancery Lane, London, April 13, 1593. He was the eldest son of Sir William Wentworth, of Wentworth Woodhouse, in the county of York. He received part of his education at St. John's College, Cambridge, and seems to have been from his early years of studious and regular habits.

In 1611 he went into France, having previously been knighted In Feb. 1612–13 he returned to England. He sat for the county of York in the parliament which began April 5, 1614. During this short parliament, which continued only two months, Wentworth does not appear to have spoken. In 1615 he was appointed to the office of custos rotulorum for the west riding of the county of York, in the room of Sir John Savile. In 1621 he was again returned to parliament for the county of York; and this time he brought in Sir George Calvert, one of the secretaries of state, along with him.

Hitherto Wentworth had not taken a very prominent part in the proceedings of parliament; still he was considered to have acted with the party that opposed the court, and he was among the number of those whom Buckingham attempted to disable from serving in parliament by having them pricked sheriffs of their respective counties. In May, 1627, he was committed a prisoner to the Marshalsea by the lords of the council for refusing the royal loan; and about six weeks after, his imprisonment was exchanged for confinement at the town of Dartford in Kent, from which place he was not to go above two miles. About Christmas he was released; and shortly after the third parliament of Charles began, in which Wentworth sat again for Yorkshire. Wentworth had now resolved to make the court party more aware of the extent of his talents than they yet appeared to be. On the discussion of the general question of grievances, he spoke with an ability and spirit which proved to them that he might turn out such an enemy, that he was worth having as a friend. Wentworth, though often called an apostate, never appears to have been at heart on the popular or rather the parliamentary side. The two volumes of his 'Letters and Dispatches' throw considerable light upon the motives which guided his conduct at this period.

In June, 1628, the parliament ended. In July Sir Thomas Wentworth was created Baron Wentworth. In Michaelmas term he was made Viscount Wentworth, Lord President of the North, and a privy counsellor. Wentworth's acceptance of this office of President of the North (the jurisdiction of which extended over the counties of York, Northumberland, Cumberland, Westmoreland, and Durham) was a flagrant violation of the fundamental principle of the Petition of Right. One of his first acts was to declare that he would lay any man by the heels who ventured to sue out a prohibition in the courts at Westminster. And one of the judges (Vernon), who had the courage to resist these encroachments on the ancient laws of the land, Wentworth tried hard to have removed from his office.

In January, 1631, Wentworth was made lord

deputy of Ireland. The principle on which he set about governing there was in substance the same as that of his government in the presidency of York. In one particular he benefited Ireland. At his own risk he imported and sowed a quantity of superior flax-seed, which led to the commencement of the linen manufacture of that country. In 1639 Charles raised Wentworth to the dignity of Earl of Strafford and Baron of Raby, and invested him with the title of lord-lieutenant, or lieutenant-general of Ireland—a title which had not been borne since the time of Essex.

In 1640 the Earl of Northumberland being attacked by severe illness, the king appointed Strafford in his place, to the command of the army against the Scots, but he effected little. In Nov. 1640 he was impeached for high treason at the bar of the House of Lords by Mr. Pym in the name of the House of Commons.

The Commons however changed their course and introduced a bill of attainder, which was passed April 21, in the Commons, and soon after in the Lords. The king, with tears in his eyes, signed a commission for giving the royal assent to the bill, and then made some feeble and unavailing efforts to save the life of his minister. 'The resort to the bill of attainder,' observes Mr. Forster ('Life of Strafford,' in 'Lardner's Cabinet Cyclopædia,' p. 404), 'arose from no failure of the impeachment, as has been frequently alleged, but because in the course of that impeachment circumstances arose which suggested to the great leader of the popular cause the greater safety of fixing this case upon wider grounds. Without stretching to the slightest extent the boundaries of any statute, they thought it better at once to bring Strafford's treason to the condemnation of the sources of all law.' Strafford was beheaded on Tower Hill, May 12, 1641. In the succeeding reign, the attainder was reversed, and his son was restored to the earldom.

STRAIGHT, STRAIGHT LINE, PLANE. There are three attempts at definition of a straight line; by Plato (or one of his immediate school), by Archimedes (as is said), and by Euclid. The Platonic definition, according to Proclus, is as follows:—'A straight line is that of which the middle parts hide the extremities;' a physical definition, owing its truth to the circumstance of the rays of light proceeding in straight lines. Archimedes defines a straight line as the shortest distance between two points, or at least this definition is often attributed to him, but not correctly. It is one of his postulates in the book on the Sphere and Cylinder, that of all lines drawn between two points the least is that which is straight. Euclid defines a straight line to be that which lies evenly between its extreme points.

The definition which Euclid gives of a *Plane*, is that of a surface which lies evenly between its bounding straight lines. To this definition there is the serious objection that though a plane may be as easily conceived as a straight line, yet it is actually capable of definition by a straight line. *For a plane is the surface any two points of which can be joined by a straight line which lies wholly on the surface.*

STRAIN. [SPRAIN.]

STRALSUND, one of the three governments into which the Prussian province of Pomerania is divided, consists of what was formerly Swedish Pomerania, with the island of Rügen and some other islands: it is bounded N. by the Baltic, E. and S. by the government of Stettin, and W. by Mecklenburg-Schwerin. The area is 1672 square miles, and the population in 1847 was 182,981. The surface is level; the soil consists of a heavy loam and black mould of great fertility; the chief products are rye, wheat, barley, peas, flax, and tobacco. The breed of horned cattle is not very numerous; sheep, hogs, and geese abound. The only manufactures of any importance are coarse linen and woollen stuffs, tobacco, and spirits. The commerce is very important; the exports consist of flour, malt, and great quantities of corn. The coast fisheries are very profitable. The chief rivers are the Peene, which separates the governments of Stettin and Stralsund; the Trebel, a feeder of the Peene; and the Recknuth, which flows N.N.W. into the Bay of Ribnitz. The two last-named rivers form the boundary on the side of Mecklenburg, save a distance of about 5 miles: with this exception, the government of Stralsund is entirely surrounded by water.

Stralsund, the chief town of the government, situated on the west shore of the Gellen strait, which separates the isle of Rügen from the mainland, is a seaport of considerable industrial and commercial activity, and has 16,000 inhabitants. Except on the side of the Gellen strait, the town is surrounded by lakes and marshes, so that it is connected with the continent only by bridges. The fortifications have been razed, and the ramparts converted into public walks. The town is rather gloomy, the houses built in the old style, the streets irregular, and the squares and market-places small: it is however clean and well paved. The three principal churches are built in the Gothic style, and contain many fine paintings. Among the other public buildings are—the government-house, the town-house, the gymnasium, with a large library and cabinet of medals, the mint, the arsenal, and the water-works. The manufactures are woollens, linen, sugar, starch, soap, candles, tobacco, leather, looking-glass, household furniture, playing-cards, spirits, and oil. The chief exports are corn, malt, and wool. Ships are built; a great number of merchant and fishing vessels belong to the port. The harbour is spacious and safe, and deep enough for ships drawing 15 feet water.

The most important among the other towns are—BARTH. *Greifswalde*, 20 miles S. by E. from Stralsund, and about 2 miles from the mouth of the Ryck, which forms a good harbour for small vessels. This town is pretty well built, surrounded by promenades formed out of the old ramparts, and has a population of 12,000. It has a university, a botanical garden, and observatory, a gymnasium, and a training school. The industrial products are soap, leather, tobacco, oil, salt, &c. Ship-building and the coasting trade are actively carried on; steamers ply regularly in the open season to Sweden. *Wolgast*, a small sea-

port town, at the mouth of the Peene, has ship-building yards, manufactures of soap and tobacco, and 4200 inhabitants, who have some coasting trade. *Putbus*, on the south coast of the isle of Rügen, gives title to a prince, and is much resorted to in summer for its baths.

STRAMONIUM. [DATURA.]

STRANGE, SIR ROBERT, was born at Pomona, one of the Orkney Isles, July 14, 1721. After adopting and abandoning the study of the law and the pursuit of a seafaring life, he was apprenticed to a drawing-master. He had studied some time, when he joined the forces of the Pretender. After the battle of Culloden he sought refuge in the Highlands. Subsequently he ventured to Edinburgh, where he subsisted upon the produce of the sale of his drawings of the chiefs of the rebellion. After his marriage, in 1747 to Miss Lumisden, he went abroad, and at Rouen obtained an honorary prize for design. He next proceeded to Paris, where he studied engraving under the celebrated Le Bas. In 1751 Strange settled in London, and soon established a high reputation as an historical engraver, of which class he is considered to be the first in the English school.

In 1760 he again went abroad; he executed plates after pictures by many of the greatest of the old masters, and was made a member of the academies of Rome, Florence, Bologna, Parma, and Paris. On his return to England he was received with every mark of distinction, and in 1787 was knighted. He died July 5, 1792. He was the author of an unpublished treatise entitled 'The History of the Progress of Engraving,' to which he added impressions of his principal plates and a portrait of himself.

STRANRAER. [WIGTONSHIRE.]

STRASBOURG, a large, ancient, and very strongly-fortified city, the capital of the French department of Bas-Rhin, is situated on the Ill and the Bruche, within two miles of the left bank of the Rhine, at a distance of 283 miles E. from Paris, in 48° 34′ 57″ N. lat., 7° 45′ 16″ E. long., and has 70,298 inhabitants. A railroad through Colmar and Mühlhausen connects the city with Basel; and another, now nearly completed, and partially in operation, through Phalsbourg, Nancy, and Châlons-sur-Marne, joins it with Paris.

Strasbourg stands on the site of the Roman Argentoratum, which, after being sacked several times by the barbarian hordes that advanced upon the Roman Empire in the fifth century, fell in 455 into the hands of the Allemans, who completed its ruin. After the victory of Zulpic, gained by Clovis and his Franks over the Allemans, in 496, a fort called *Strateburgum* was built on the site of the ruined city. The city remained little better than a heap of ruins till the year 718, when Adelbert, duke of Alsace, founded the abbey of St.-Étienne. From 870, it continued annexed to the German Empire, and was nominally governed by counts and bishops, but still maintained the right of making its own laws and naming its own magistrates, subject only to the approbation of the bishop and his chapter. These privileges, with the power to impose taxes, and make treaties, besides several other immunities, were granted to or conferred on the city by an edict of the Emperor Philip, in 1205. Soon after, in 1253, Strasbourg and the other cities on the Rhine, from Basel to the Moselle, formed a league for their mutual defence, and maintained a force of 100 boats, manned by archers, to keep the navigation of the Rhine free. From this time, for nearly three centuries, the history of the city presents a continued and mostly successful struggle of the citizens in defence of their liberties against their bishops, or against the robber nobles, many of whose castles they levelled, and whose heads they cut off, for injuries done to their commerce. In 1528 the doctrines of Luther were ardently received, and several of the churches were soon after occupied by the reformers. By the treaty of Westphalia, the house of Habsburg ceded the sovereignty of Alsace to France, and Louis XIV. made a solemn entry into Strasbourg, Oct. 23, 1681.

The town stands in a flat situation in the valley of the Rhine. It is irregular in form, and its circuit is five or six miles. It is surrounded by a wall strengthened by bastions, ditches, and outworks, and has at its eastern extremity a citadel, with five bastions, constructed by Vauban, the outworks of which extend as far as the Rhine. The entrance into the city is by seven gates, two on the north side, one on the north-west, two on the west, and two on the south.

The river Ill flows through the town in a north-north-east direction. After it enters the town it is divided into several branches, which reunite before it quits the place. The principal arm, which bears the name of the Bruche, is navigable, and receives on its right bank the canal of the Rhine. The river can be made to inundate the neighbourhood, by means of a sluice at the point where it enters the town. There are 47 bridges in the interior of the city, 9 of which are of stone and covered, the rest are all of wood. The branches of the Ill seem to have been ditches dug to encircle and defend the town before it had attained its present extent.

The city is, generally speaking, well built; the principal streets are wide and well laid out; the squares large and regular. The houses are high, and surmounted by lofty roofs, furnished with two or three tiers of windows; those in the principal streets have their windows protected by numerous iron bars, and formed of small panes inserted in leaden frames. The greater number of the streets however are narrow and crooked, being in fact mere lanes, though the houses are nearly all solidly built of stone. The high-roofed picturesque houses mentioned above are gradually disappearing to make room for more modern structures.

The principal public building is the cathedral of Notre-Dame, a Gothic edifice of singular beauty, founded in 1015 and not completed till 1439. The interior is 357 feet long, 79 high from the pavement to the vault, and 35 wide, not reckoning the aisles, which are separated from the nave by 9 massive pillars on each side. The interior is lighted through splendid stained glass windows,

one of which, over the great western portal, is a magnificent circular window 48 feet in diameter. The stone pulpit, unequalled for the richness, variety, and beauty of its sculptured ornaments; an organ of admirable power and softness; and the famous astronomical clock in the south transept, are the most remarkable objects of the interior. The clock was made in 1571, and after going for about 200 years it got out of order, and was useless for above 50 years; it has been recently put into complete repair by a watchmaker of the town, and still maintains its character as a most elaborately-finished, complicated, and surprising piece of machinery. The western front, exceeding 230 feet in height, with its triple portal decorated with sculptures, statues, and basreliefs, is a masterpiece of enriched architecture. Above the portals, the most striking features are the enormous marygold window mentioned above, and the equestrian statues of Clovis, Dagobert, and Rudolph of Hapsburg, in canopied openings in the buttresses. The upper portion of the west front has some beautiful windows. The northern tower is surmounted by a spire, terminating in a cross, which is 466 feet above the pavement. This spire was commenced in 1277, but was not finished till 1439. No attempt has been ever made to erect a spire over the south portal, though this formed part of the original design. Such is the admirable finish and delicacy of the workmanship, and so great the hardness of the material with which the west front is constructed, that it has been compared to a veil of the finest cast-iron thrown over the more solid parts of the gigantic mass of building. The cathedral was much injured during the first French Revolution, but has been since restored.

Of the other churches the most remarkable are those of St.-Étienne (the oldest structure in Strasbourg), St.-Jean, Sainte-Aurelie, St.-Pierre-le-Vieux, in the Grand Rue, St.-Pierre-le-Jeune (the choir of which belongs to the Catholics, the nave to the Lutherans), the Temple Neuf, formerly a Dominican now a Lutheran church (in which are a series of paintings representing the Dance of Death), St.-Louis, St.-Thomas, now used by the Lutherans (which contains the monument of Marshal Saxe), St.-Nicolas, and St.-Guillaume. The principal civic buildings are the episcopal palace; the residence of the prefect; the town-hall; the custom-house; the court-house; the academy buildings, which contain extensive collections of natural history and anatomy, and a medical library of 12,000 volumes; the college buildings, erected by the Jesuits; the large episcopal seminary; the civil hospital; the orphan asylum; the corn-market; and the theatre, which is adorned with an Ionic colonnade, and has a spacious and elegant interior. The public library of Strasbourg, consisting of above 130,000 volumes, is kept in the building of which the Temple-Neuf formed a part; it is divided into three sections—one containing the books of the former Protestant university, a second those belonging to the town, and a third is filled with the books collected from the suppressed monasteries. Among the military structures must be named the arsenal; the artillery school and cannon-foundry; the Finkmatte and several other barracks; and the hospital.

The public walks are numerous; those called la Robertsa and le Contades are the most frequented. The former extends from the glacis on the north of the town; it is planted with fine avenues of lime trees, and crossed by a canal from the Ill to the Rhine; the latter commences just outside the Jew's Gate; it is planted with trees in quincunxes. The banks of the Rhine, the Ill, and the Bruche also afford pretty walks and views. On an island in the Rhine, seen on the road to Kehl, is a monument in honour of Desaix. A statue of Gutenberg, who made his earliest attempt at printing here, has been erected in the vegetable market, now called Place Gutenberg. On the Polygon, a piece of ground about a mile from the town, used as exercising ground for the artillery, a monument is erected to General Kleber.

Strasbourg gives title to a bishop. It has tribunals of first instance and of commerce; an exchange and chamber of commerce; a mint; a Council of Prud' Hommes; a custom-house; and bonding warehouses. It has a University Academy which confers degrees, and in connection with which there are in the town faculties of law, Lutheran theology, medicine, science, and letters, and a national college. There are also an ecclesiastical college, a diocesan seminary, schools of midwifery and pharmacy, a society of agriculture, science, and art, besides various other educational, literary, and scientific institutions. Strasbourg is the seat of the Lutheran consistory for the departments of Bas-Rhin and Haut-Rhin; and of the consistorial synagogue of the Jews.

The trade of the town is very considerable: its manufactures include jewellery, metal buttons, starch, alum, soap, watches and clocks, chemical products, steel, cutlery, pins, combs, cast-iron goods, earthenware, porcelain, enamel, oil from seeds, morocco and other leather, hats, woollen and cotton stuffs, cotton yarn, hosiery, printed flannels, sail-cloth, oilcloth, thread, carpeting, furs, paper-hangings, playing-cards, &c. There are bleach-grounds, dye-houses, rope-walks, tan-yards, breweries; chicory, mustard, and madder-mills; printing-offices, plaster-kilns, tile-yards, an iron-forge, a type-foundry, sugar refineries, a snuff-manufactory, &c. There is a considerable trade carried on with Holland, Germany, Switzerland, and Italy; and much business is done in the produce of the surrounding territory, which includes corn, wine, tobacco, madder, hemp, hops, saffron, &c. Four important yearly fairs are held.

STRATA. [Geology; Stratification.]

STRATE'GY (from the Greek στρατηγία, which may be translated 'generalship') is properly the science of combining and employing the means which the different branches of the art of war afford for the purpose of forming projects of operations and of directing great military movements: it was formerly distinguished from the art of making dispositions, and of manœuvring, when in the presence of the enemy; but military writers now, in general, comprehend all these subjects under the denominations of grand and elementary tactics. [Tactics.]

STRATFORD. [ESSEX.]

STRATFORD-UPON-AVON. [WARWICKSHIRE.]

STRATFORD, STONY. [BUCKINGHAMSHIRE.]

STRATICO, SIMONE, COUNT, born at Zara, in Dalmatia, in 1730, of a family originally from Candia, studied at Padua, where he took his doctor's degree, and was made professor of medicine in that university when only twenty-five years of age. In 1761 he accompanied to England the ambassador sent by the Venetian senate to congratulate George III. on his accession; and on his return to Padua he succeeded the Marquis Poleni in the chair of mathematics and navigation. His principal works are—1, 'Raccolta di Proposizioni d' Idrostatica ed Idraulica,' Padova, 1773; 2, 'Vocabolario di Marina,' 3 vols. 4to., Milan, 1813-14; 3, 'Bibliografia di Marina,' 1823; 4, 'M. Vitruvii Pollionis Architectura cum Exercitationibus J. Poleni et Commentariis Variorum,' Udine, 1825. Stratico was one of the most distinguished men of science in Italy. He died at Milan in 1824, being then 94 years of age.

STRATIFICATION. Mineral masses, separately deposited, and arranged into parallel layers under the influence of gravitation, compose a large portion of the known rocky crust of the earth, and are called *Stratified Rocks*. Other masses, in which no such successive deposition and tendency to be bounded by originally horizontal surfaces is traceable, are called *Unstratified Rocks:* these are generally supposed to be of igneous origin; the former are mostly known to be the result of sedimentary aggregation under water. To each class there are however exceptions.

The origin of the materials of stratified rocks is seldom obscure. Conglomerates full of pebbles rounded by attrition, sandstones with grains worn and rounded, shales and clays with broken and scattered mica, and disseminated fragments of other minerals, are so similar to ordinary accumulations by the diurnal agency of water, that no person can hesitate about the origin of such materials. Many of these are *Recomposite Rocks;* as the old red sandstone conglomerates, which contain pieces of quartz from mineral veins, and masses of previously-consolidated grauwacke. Others, as new red sandstones, seem to be derived from wasting shores or the detritus of inundations. Well-stratified limestones have probably been formed from precipitation of carbonate of lime, as now happens in lakes and in the sea.

The changes to which the sedimentary deposits, which were the origin of stratified rocks, have been subject since their aggregation, are so considerable, as to gain for them, in extreme cases, the distinctive title of *Metamorphic Rocks.*

Consolidation of mass is the first of these changes to which we may here allude. It appears to be a phenomenon principally due to *pressure:* as in the buried peat of Dartmoor, and the buried clays of Holderness, the originally light and uncondensed matters have been compressed to some considerable firmness, solidity, and weight; so in respect of ancient clays, mere pressure appears to be a sufficient cause for their condensed and often shaly consistence. The *induration* of slate, coal, limestone, and sandstone, seems to be due to some force additional to the above: probably to the internal heat of the globe. Very unequivocal signs of this action of heat appear in the vicinity of the granite rocks of Cumberland, Devon, Cornwall, Wicklow, &c., and perhaps they are seldom absent from such situations. One of the most ordinary of such effects is the development, in the mass of the stratified rocks, of peculiar crystals, as felspar near the granite of Wastdale Head, in virtue of which slates become porphyry; of hornblende and chiastolite in those of Skiddaw, just as garnets are developed in argillaceous beds near the trap rocks of Teesdale and Anglesey.

Some cases of re-arrangement of particles depend on molecular action, not excited by heat, but determined to particular centres by the previous existence there of solidified bodies. Oolite is an example of common occurrence among limestones of the secondary class, and few things are more interesting to examine than a polished slab of the oolite of the mountain limestone of Bristol and Lancashire, or the pisolite of Wilts.

Derived from sources so various, and aggregated under aqueous agencies so diversified in respect of power and direction, it is not surprising that the stratified rocks present themselves in a variety of appearances. It is clear that in the same bed of the ancient sea, or on the same basin of the actual sea, contemporaneous surfaces of deposition might extend over calcareous, argillaceous, arenaceous, and pebbly deposits: that in different basins contemporaneous deposits might be extremely unlike; and that metamorphism, more or less important, must be allowed to have often further increased such original diversity. Yet, notwithstanding these limitations, it appears to be a fact sufficiently established that there are general characters of mineral composition and structural aggregation which are associated with the strata of each great period of the earth's history, so as more or less completely to distinguish one period from another. [GEOLOGY.]

STRATIO'TES, a genus of endogenous plants belonging to the natural order *Hydrocharideæ. S. aloides,* Water-Soldier, is a very ornamental aquatic plant, and is found in ditches in the east of England. It remains under water during the greater part of the year, but raises itself to the surface on special stalks during the season for fertilising the seeds.

STRATON, the son of Arcesiláus, and a native of Lámpsacus, a Peripatetic, who about B.C. 286 undertook the charge of the Peripatetic school after Theophrastus. All the works of Straton have perished. He differed from his master Aristotle on certain points. He maintained that there was a principle of motion destitute of intelligence inherent in all matter; which principle causes all composition and decomposition of bodies; that the world, in consequence, was not formed by an extramundane deity, nor by any intramundane animating pervading intelligence; but that it was formed by the innate force of matter, which momently creates and dissolves.

STRATTON. [CORNWALL.]

STRAUBING, a town in the province of

Lower Bavaria, 25 miles E. from Ratisbon, on an eminence above the right bank of the Danube, has 8000 inhabitants. The town, which is tolerably well built, is surrounded with decayed walls, in which there are four principal gates. There are four hospitals, a gymnasium, a training-school for schoolmasters, and numerous charitable institutions. The handsomest part of the town is the great square, in which are the church of the Holy Trinity, the palace, the town-house, the government-house, and the church of St.-James and St.-Veit. Straubing stands in a remarkably fertile country; it has no manufactures of importance, the population being chiefly engaged in agricultural pursuits. Large corn and cattle markets are held; beer is extensively brewed, and there is a considerable trade in agricultural and other products on the Danube.

STRAW-PLAT. It is not known when the manufacture of hats or bonnets of platted straw first became important in Italy, where it has long formed one of the leading pursuits of the agricultural population; but it appears from Coryat's 'Crudities,' published in 1611, that 'delicate strawen hats' were worn at that time by both men and women in many places in Piedmont. The straw-plat manufacture does not appear to have been followed in England more than seventy or eighty years.

The large size of the wheat-straw used in this country for platting prevented the home manufacture from entering into competition with that of Italy in articles of fine quality; the straw grown for the purpose in Tuscany being much smaller, as well as superior in colour. This difficulty was in some degree overcome by the expedient adopted in England towards the end of the last century, of splitting the straw, and using the narrow *Splints*, or slips of straw, in lieu of whole straws. The operation of splitting is performed by small cutting instruments called *machines*, which have a number of sharp edges so fixed as to divide the straw, by a motion in the direction of its length, into four, five, six, or more equal parts. Before machines were invented, straws were occasionally split with knives by hand. But greatly as the British straw-plat manufacture had been encouraged by the use of split straw, by improvements in bleaching, and by increased care in the selection of straws of uniform size and colour, it was found, when the re-establishment of peace allowed the free importation of Italian straw bonnets, that the home manufacture was unable to compete with the foreign, notwithstanding the heavy protecting duty levied upon hats or bonnets of straw imported from other countries. The Society of Arts therefore, for a long series of years, offered encouragement to attempts for the improvement of the British straw manufacture, which called forth many interesting communications, and led to great improvement.

In plat made of split straw, unless two splints are laid together, with their inside surfaces towards each other, as in the plat called Patent Dunstable, it necessarily happens that the face of the plat exhibits alternately the outer and inner surfaces of the straw, which differ from each other in colour and gloss. Articles made of split straw are also inferior to those of whole straw of equal fineness, in pliability and durability. Another circumstance which greatly increases the beauty of Leghorn plat is the mode of joining it, so as to form, by the combination of several narrow strips, an extended sheet of platted work. British plat is usually joined by making the several rows of plat overwrap each other a little, and then stitching through the two overwrapping pieces with a needle and thread. The surface of a hat or bonnet formed in this manner consists of a series of ridges; and part of each row of plat is concealed by that next above it, so that an unnecessarily large quantity of plat is required to form a given extent of surface. Leghorn plat is formed in such a manner that it may be joined without this loss; the edge of one row of plat being, as it were, knitted into the edge of the other, in such a way that the patterns may appear uninterrupted, and the line of junction may be almost invisible.

The Society of Arts has encouraged the growing of straw similar to that of Leghorn, the platting of the Leghorn straw in England, and every other device which might seem likely to increase the home manufacture. Mr. Parry in 1822 received the Society's large silver medal for his method of manufacturing Leghorn plat from straw imported from Italy. In this method the ears are cut off with a knife, and the straws are then carefully sorted to obtain uniformity in length, thickness, and colour. Thirteen straws are tied together at one end, and then divided into two portions; six straws being towards the left side, and seven to the right, so that the two portions of straw may form a right angle. These are platted over and under each other, so as to form a platted band, about three-eighths of an inch in width. Several of these bands are adjusted in spiral coils, with their adjacent edges knitted together, so as to form the large circular pieces of plat which, under the name of hats, or *flats*, are so extensively exported from the north of Italy.

The straw used in Tuscany is that of *Triticum turgidum*, a variety of bearded wheat, which seems to differ in no respect from the spring wheat grown in the vale of Evesham and in other parts of England. It is grown in Tuscany solely for the straw, and not for the grain; and the upper joint of the straw is that chiefly used for platting. The straw is pulled while the ear is in a soft milky state; the corn having been sown very close, and consequently produced in a thin, short, and dwindled condition. It is then dried by spreading it thinly upon the ground in fine hot weather, and afterwards tied up in bundles and stacked, for the purpose of enabling the heat of the mow to drive off any remaining moisture. After remaining in the mow for about a month, it is spread out in a meadow, and exposed to the action of dew, sun, and air, in order to bleach it. The straw is frequently turned during this operation; and after it is completed, the lower joint of the straw is pulled off, leaving the upper joint, with the ear attached to it, for use. This part is then subjected

to the action of steam, and to fumigation with sulphur, in order to complete the bleaching, after which it is ready for use. It is tied up in bundles, and imported to England in this state.

Bleaching the straw with sulphur fumes is commonly practised in this country, and Dr. Ure states that a solution of chloride of lime may be used for the purpose. Straw may be dyed, for ornamental purposes, of many different colours.

The splints, or pieces of split straw, being curved in a way which would impede the operation of platting, require to be flattened between rollers. These, as well as the whole straws used in other kinds of plat, are moistened with water to render them easy to work. It need hardly be observed that cleanliness is indispensable to the beauty of the plat.

In the kind of straw-platting above described, the plat is formed into a narrow strip or riband, which must be formed into a spiral coil, or united edge to edge, to form a hat or bonnet; but in 1834 Mr. T. B. Smith, of St. Alban's, devised a mode of applying Brazilian plat to the manufacture of hats and bonnets of split staw. This kind of plat is not formed in strips, but is at once platted or woven into the required form and size. One advantage claimed for the method is that either the glossy or the dull surface of the split straw may be placed entirely on one side of the plat.

The British straw plat district comprises Bedfordshire, Hertfordshire, and Buckinghamshire; those counties being the most favourable for the production of the wheat-straw commonly used for English plat. The manufacture is also followed in a few places in Essex and Suffolk; but very little in other counties. The principal markets are Luton, Dunstable, amd St. Albans.

In 1847, 1376 lbs. weight of chip hats were imported, and 7117 lbs of straw hats; together with 35,530 lbs. of chip-plat, and 13,420 lbs. of straw-plat, for making hats and bonnets; and 892 cwts. of straw-platting.

STRAWBERRY, the English name of the fruit and plant of the *Fragaria*, a genus of plants belonging to the natural order *Rosaceæ*. The fruit of the *Fragaria* is one of the most delicious of our summer fruits.

Several species of this genus have been described. Linnæus gave only 2; but Wildenow admitted 8; and G. Don, in 'Miller's Dictionary,' enumerates 14. All of them are natives of temperate or cold climates; and are found in Europe, America, and the mountains of Asia.

As, with regard to plants so extensively cultivated as the strawberry, it is frequently difficult to distinguish between the varieties and species, we shall follow Don, and enumerate those species which afford the varieties of cultivated strawberries.

Wood or Alpine Strawberry (*Fragaria vesca*) is found wild in woods throughout Europe, and is abundant in Great Britain. Hill Strawberry (*Fragaria collina*) is a native of Switzerland and Germany, and is characterised by its producing green fruit. The varieties of strawberries which are called Green Strawberries are the produce of this species. The *Fragaria Majaufica* is a native of France, and produces a fruit which is known in that country under the name of *Majaufe*. The Hautbois (*Fragaria elatior*) is a native of North America, and is occasionally found in groves in the south of England. The shape, size, and colour of the fruit of the hautbois are subject to great varieties, according to its mode of cultivation. It is the parent of a great number of sorts known in gardens, most of which, when properly managed, produce fruits of a first-rate kind. Virginian Strawberry (*Fragaria Virginiana*) is a native of Virginia, and to this species belongs the great list of sorts cultivated in gardens and known by the name of Scarlet and Black Strawberries. The various kinds of Scarlet, Globe, Cone, and some Pine Strawberries are produced from this species. Large-Flowered Strawberry (*Fragaria grandiflora*) is a native of Surinam, and has furnished our gardens with the sorts called Pine Strawberries. The various sorts named Bath, Pine, Carolina, Dutch, and others, belong to this species. Chili Strawberry (*Fragaria Chilensis*) is a native of South America, both in Chili and Peru, and is the parent of a number of mostly inferior strawberries. The other species of *Fragaria* do not bear strawberries that are worthy of cultivation. Strawberries, when ripe, may be eaten in almost any quantity without injury. They are frequently eaten mixed with sugar and cream or wine. When ripe and well grown they hardly require such additions; but when their sugar is deficient, this ingredient may be safely added; and the addition of wine under these circumstances should be preferred to cream, as the latter is very liable to disagree with delicate stomachs.

Strawberries may be propagated either by means of their suckers or runners, or by sowing seed. The young plants will generally bear the year after they have been planted or sown. In order to obtain the fruit in perfection, they should be planted where they have access to abundance of light and air. Plants grown from runners are best for new beds, and should be planted out in March, in beds with three or four rows, leaving an alley between each bed. The alleys should be wide, the beds kept clear from weeds, and the runners cut at least three times in the season. In the autumn the rows should be dug between, and in the spring some straw or dung should be laid between the rows. If the latter produces too luxuriant a growth of the plants, it should not be employed.

STREAMER. [BANNER.]

STREATHAM. [SURREY.]

STRELITZ. [MECKLENBURG.]

STRENGTH OF MATERIALS. [MATERIALS, STRENGTH OF.]

STRENGTH OF COLUMNS. [FLEXURE OF COLUMNS.]

STREPSISTERA (*Rhipiptera* of Latreille), a very extraordinary order of insects, first observed by Mr. Kirby, and remarkable for having the anterior wings transformed into a pair of short, slender, contorted appendages, whilst the posterior are very large and fold in the manner of a fan. The mouth is armed with two slender acute jaws and two 2-pointed palpi. The tarsi are 2- 3- or 4-jointed. The larva is vermiform

and has no feet. The pupæ are inactive. They are all very small creatures, the largest not so long as a quarter of an inch. The larvæ are parasitic on the bodies of wasps and bees. The perfect insects are very short-lived, but very active. (Kirby in 'Monographia Apum Angliæ,' vol. ii., p. 3.)

STREPTOSPO'NDYLUS, H. von Meyer's name for an extinct genus of reptiles belonging to the *Cœlospondylian Tribe* of the *Crocodilian Order* in the arrangement of Professor Owen, who thus defines the vertebral characters of this highly-interesting form, the *Steneosaurus rostromajor* of Geoffroy, and the *Crocodile d'Honfleur* of Cuvier:—

'The distinguishing vertebral characters are a ball-and-socket articulation of the bodies of the vertebræ; but the positions of the ball and cavity are the reverse of those in the existing crocodiles, the convexity being on the anterior part of the vertebræ, and the concavity directed backwards. In the anterior vertebræ, which have the ribs articulated with the body, there is a deep pit behind the costal articular surface; the transverse process rises by four salient ridges, one from each oblique process, and the two inferior and principal ones from the base of the neurapophysis; these ridges converge at an acute angle as they ascend, and meet at the under part of the transverse process, so as to include a triangular space, which is deeply concave. A third salient ridge ascends from the fore part of the base of the neurapophysis to the anterior oblique process, nearly parallel with the posterior of the two last-mentioned ridges, so that the side of each neurapophysis appears as if marked with the letter N in high relief. In the cervical and anterior dorsal vertebræ there are, instead of a single inferior spinous process, two ridges, which terminate each in front by a tubercle.'—('Report on British Fossil Reptiles.' *British Association.*)

The Professor states that, as far as he is aware, no remains of this genus have till recently been found in any of the British strata; and to him is due the recognition of the remains of this animal from the oolite in the vicinity of Chipping-Norton. He has moreover discovered the remains of this extinct form in the jet rock (lias schale) near Whitby, and in the Wealden formation from three localities, Tilgate Forest, Sussex, and Brook Point and Culver Cliff, in the Isle of Wight.

The foreign localities in which remains of *Streptospondylus* have been found are the Oxford-clay formation at Honfleur, the Kimmeridge-clay at Havre, and the lias of Altdorf.

STRETTON. [SHROPSHIRE.]

STRIGIDÆ (OWLS, *Bubo*), the family name for the Nocturnal Birds of Prey, the *Ægolians* of Vieillot. [RAPTATORES; RAPTORES.]

This natural family have large heads, and great projecting eyes, directed forwards, and surrounded by a disk (more or less developed according to the more or less nocturnal or diurnal habits of the species) formed of loose and delicate feathers; a raptorial beak; crooked claws; and a downy plumage, generally spotted, powdered, or barred with different shades of brown and yellow.

An account of the structure of these birds by Mr. Yarrell will be found in his 'Anatomy of Birds of Prey' ('Zool. Journal,' vol. iii.).

This able zoologist well observes that, from the loose and soft nature of the plumage in these birds, as well as their deficiency in muscle and bone, rapid flight is denied them as useless, if not dangerous, from the state of the atmosphere at the time they are destined to seek their food; but, he adds, they are recompensed for this loss, partly by their acute sense of hearing, from an extension of the posterior edge of the cranium forming a conch, coupled with a very large external orifice, and partly by the beautifully serrated exterior edge of the wing primaries, which, allowing them to range without noise through the air, enables them to approach unheard their unsuspecting victim, which falls a prey to the silent flight and piercing eye of an inveterate enemy. He further remarks, that some increase and variation will be found in the strength and form of such of the owls as depart from the type of the true nocturnal bird. In the snowy owl and short-eared owls, which are described as occasionally taking their food by day, the furcula, Mr. Yarrell observes, is stronger and less angular in proportion than in the wood and barn owls. With regard to the senses, those of sight and hearing are particularly perfect. In these birds, as an exception to the general rule, the bony ring surrounding the orbit is concave, forming a sort of tube (similar to a watchmaker's glass), at the end of which is placed the transparent cornea, carried forward beyond the intervention of the loose and downy feathers of the head.

It is this position of the eyes, observes the same author, giving a particular fulness and breadth to the head, which has gained for the owl the intellectual character universally awarded to it. The concave facial disk of feathers with which they are surrounded materially aids vision by concentrating the rays of light.

Mr. Yarrell goes on to observe that the extent of vision enjoyed by the falcons [FALCONIDÆ] is probably denied to the owls, but their more spherical lens and corresponding cornea give them an intensity better suited to the opacity of the medium in which their power is required to be exercised. 'They may be compared,' says he, 'to a person near-sighted, who sees objects with superior magnitude and brilliancy when within the prescribed limits of his natural powers of vision, from the increased angle these objects subtend.'

It has been rightly stated that the *Strigidæ* not only look but listen for prey. The slightest rustle, the least noise, is sufficient to arouse attention. The external auditory meatus is wide, and guarded by a fold of delicate integument, as well as by an ample developed circle of auricular feathers, which together fulfil the functions of an external concha. The tympanum is very thin and transparent.

All naturalists agree as to the position of these birds in the great class *Aves*, however they may differ in minor points. Here we may refer to Willughby, Brisson, Linnæus, Latham, Duméril, Illiger, Temminck, and others; and also Mr. Vigors's

paper 'On the Natural Affinities of Birds' ('Trans. Linn. Soc.,' vol. xiv.), in which his views respecting the *Strigidæ* are unfolded at full length.

Mr. Swainson states that the divisions of the *Strigidæ* made by modern ornithologists can all be referred to one or other of the following groups:—1, Typical Owls, having the facial disk very large and complete, with large ears and (in general) an ample operculum; 2, Horned Owls, furnished with egrets and a large facial disk, but having only small or moderate-sized ears; and 3, Diurnal or Hawk Owls, where the conch of the ear is comparatively small, and is destitute of an operculum: the head has no egrets, and the facial disk is imperfect or obsolete. The first he considers the typical group; the second, the subtypical; and the third, the aberrant group.

(For a more complete exposition of Mr. Swainson's views, see his 'Classification of Birds,' vol. i., and synopsis in vol. ii.)

The Prince of Canino, in his 'Geographical and Comparative List of the Birds of Europe and North America,' gives the following arrangement of the *Strigidæ*.

Subfam. *a. Surninæ.*

Genera. — *Surnia*, Dum.; *Nyctea*, Bonap.; *Glaucidium*, Boie; *Athene*, Boie (*Nyctipetes*, Sw.); *Scops*, Sav.

Subfam. *b. Buboninæ.*

Genera.—*Bubo*, Cuv. (*Asio* and *Heliaptex*, Sw.); *Syrnium*, Cuv. (*Scotiaptex*, Sw.).

Subfam. *c. Ululinæ.*

Genera. — *Otus*, Cuv.; *Brachyotus*, Gould; *Ulula*, Cuv.; *Nyctale*, Brehm (*Scotophilus*, Sw.).

Subfam. *d. Striginæ.*

Genus, *Strix*, Linn.

This arrangement is closely followed by Mr. G. R. Gray, who however regards the *Strigidæ* as a family of his *Accipitres Nocturni*, the second suborder of his first order *Accipitres*.

Geographical Distribution of the Family.—Very wide; extending as high as the Polar Sea, where *Strix Nyctea* is recorded by E. Sabine as having been seen on the islands in the summer months, and by James Ross as having been observed about Victoria Harbour throughout the winter, where several pairs had bred in the preceding autumn; and as low at least as Port Famine in the Straits of Magalhaens (*Strix rufipes*, *Strix nana*, &c., King). Species are found in Europe, Asia, Africa, America, and in Australia.

Food.—Birds and quadrupeds, and even fish (in the case of *Strix nyctea* and *Strix flammea*), according to the size of the species. Hares, partridges, grouse, and even the turkey, are attacked by the larger horned owls of Europe and America; while mice, shrews, small birds, snakes, and crabs, suffice for the inferior strength of the smaller *Strigidæ*. Mr. Yarrell states that the short-eared owl (*Strix brachyotus*) is the only bird of prey in which he ever found the remains of a bat.

The species are numerous, and the British Museum contains a very fine collection of them. Our limits will not permit us to do more than notice a very few. The larger horned owls are described in the article Bubo.

1. The Common Barn Owl (*Strix flammea*), a beautiful species, too well known to need a detailed description.

This is the *Effraie*, *Fresaie*, and *Petit Chathuant Plombé* of the French; *Barbagianni*, *Alloco Commune e Bianco* of the Italians; *Schleierkauz*, *Perlschleirkautz*, and *Perl-Eule* of the Germans; *Barn Owl*, *White Owl*, *Church Owl*, *Gillihowlet*, *Howlet*, *Madge Howlet*, *Madge Owl*, and *Screech Owl* of the British.

Barn Owl (*Strix flammea*).

Geographical Distribution.—Very wide. Common in England and Ireland, less common in Scotland. Not common in the Orkneys, but present in some of the islands. Found in Denmark, but said not to inhabit Sweden or Norway; generally spread over temperate Europe; found in Madeira; common in Lorraine; extending in Africa from the north to the Cape of Good Hope; met with in India and Japan. African and Japanese individuals are, M. Temminck tells us, precisely similar to those of Europe; and those of North America (where it is found in the United States, but does not appear to visit the Fur-countries) differ only in having some slight tints of more sombre hue. Those of South America (the *Yellow Owl*) are different.

Habits, Food, &c. — Montagu says that this species is never known to hoot. Mr. Yarrell states that it screeches, but does not generally hoot. Sir W. Jardine declares that he shot one in the act of hooting; and that at night, when not alarmed, hooting is their general cry. It snores and hisses, and, like other owls, when annoyed or frightened, snaps its bill loudly. Rats, mice, shrews, young birds, and beetles form their food, and the mice especially suffer when the white owl has a young brood to sustain. It has been seen to catch fish. This owl frequents churches, old buildings, and barns, often breeding in the latter, as well as in hollow trees near farmyards and villages. The nest is but a rough one, and the female lays three or four white eggs more oval than those of the brown or ivy owl, and not so large. Young have been found so late as July, September, and even December. Mr. Blyth, in the 'Field Naturalist's Magazine (vol.

i.), throws some light upon this. 'A nest of the barn-owl, last summer,' says he, 'in this neighbourhood (Tooting) contained two eggs, and when these were hatched two more were laid, which latter were probably hatched by the warmth of the young birds; a third laying took place, after the latter were hatched, and the nest at last contained six young owls of three different ages, which were all reared.' Mr. Yarrell states that he has frequently been told by boys in the country, that they had found eggs and young birds at the same time in this bird's nest. The food is generally swallowed whole, and the bones and fur or feathers rejected in pellets called castings, as indeed is generally the case with this family.

In captivity the Barn-Owl is sociable with other birds, but will sometimes, like the dogs, hide what remains of its meat.

2. *Surnia Uralensis.* — *Description.* — Face whitish, tail much graduated, much longer than the wings; all the plumage striped with large longitudinal spots and streaks.

This is the *Strix Uralensis* of Pallas; *La Chouette des Monts-Urals*, Sonnini; *Ural Owl*, Latham.

Geographical Distribution.—Arctic regions of the Old World, Lapland, North of Sweden, Norway and Russia, Livonia and Hungary, and Japan. Very rare in the eastern parts of Germany; very accidentally found elsewhere. Mr. Gould regards it as one of the rarest of European owls.

Habits, Food, &c.—Leverets, rats, mice, ptarmigan, and small birds. The nest is formed in the holes of trees, often near the habitations of man. Mr. Gould states that the number of eggs is two; M. Temminck says three or four: they are pure white.

3. *Strix Funerea.*—This is the *Strix Ulula*, Linn.; *Strix Hudsonia*, Wils.; *Chouette de Canada* and *Chouette Epervière*, Buffon; *Habichts-Eule*, Bechst.; *Hawk-Owl* of Pennant and Wilson; *Little Hawk-Owl* of Edwards; *Canada Owl* of Latham.

Geographical Distribution.—The Arctic Circle and Arctic regions of both continents; sometimes seen as a bird of passage in Germany, more rarely in France, but never in the southern provinces. In Britain it does not appear to have been seen; but one was taken in a collier a few miles off the coast of Cornwall in 1830.

Habits, Food, &c.—The visual organs of this species are more able to bear the light of day, at least in dull weather, and, like the Snowy Owl, it hunts frequently in the daytime. The smaller head and less perfect facial disk, combined with these habits, have obtained for it the name of Hawk-Owl.

4. *Strix Nyctea.*—This is the *Strix nyctea* of Forster, Latham, and Gmelin; *Strix candida* of Latham; *Chouette Harfang* of Buffon; *Chouette Blanche* of Le Vaillant; *Alucco Diurno* of 'Stor. degl. Ucc.;' *Schneekauts* of Bechstein; *Ermine Owl* and *Snowy Owl* of Latham; *Great White Owl* of Edwards; *Snow Owl* of Wilson.

Geographical Distribution.—Arctic regions of the Old and New World, Iceland, Sweden, Norway, Lapland, and the north of Europe generally. The Shetland Isles possess it, but, some think, in winter only. In the Orkneys it appears to be accidental. It has been shot in Scotland, England, and Ireland, and has been occasionally seen in Germany: in Holland a young bird was seen in the winter of 1802. It does not appear to have been seen in France. Dr. Richardson states that it frequents in summer the most arctic lands that have been visited, but retires with the ptarmigan, on which it preys, to more sheltered districts in the winter. 'Even in the latter season however,' says that author in continuation, 'it is frequently seen within the confines of the Arctic Circle; though it is not very uncommon at the same period in Canada and the northern parts of the United States; and now and then it has been known to wander as far south as Florida. . . . It hunts in the day; and indeed unless it could do so, it would be unfit to pass the summer within the Arctic Circle. When I have seen it on the barren grounds, it was generally squatting on the earth, and if put up, it alighted again after a short flight; but it was always so wary as to be approached with great difficulty. In the woody districts it shows less caution, and, according to Hearne, has been known to watch the grouse-shooters a whole day for the purpose of sharing in the spoil. On such occasions it perches on a high tree, and when a bird is shot, skims down, and carries it off before the sportsman can get near it. It preys on lemmings, hares, and birds, particularly the willow-grouse and ptarmigan.'

The following are also European species:—*Bubo maximus, Bubo Ascalaphus, Otus vulgaris, Otus brachyotus, Scops Aldrovandi, Surnia cinerea, Ulula nebulosa, Syrnium Aluco, Noctua nudipes* (Gould—*Strix nudipes*, Auct.), *Noctua Tengmalmi*, and *Noctua Passerina* (Gould—*Strix passerina*, Auct.).

Of Asiatic owls we can only notice the *Strix Badia* of Horsfield, a native of Java. It has a general resemblance both in colours and habits to our common Barn Owl. Dr. Horsfield states that eight species of Owls from Java have been arranged in the Museum at the India House: three are Eared Owls (that is, with egrets) and five Smooth-Headed Owls. Of the African Owls we may notice *Strix Capensis*, Smith (allied to *Strix flammea*); *Athene Capensis* (*Noctua Capensis*, Smith); and *Otus Capensis*, Smith.

Reverting to America, our limits will only permit us to notice, in addition to the species above recorded which are common to Europe and America, the well-known Burrowing Owl (*Noctua cuniculuria*). Mr. Darwin states that this species, on the plains of Buenos Ayres, exclusively inhabits the holes of the bizcacha or viscacha [CHINCHILLIDÆ]; but that in Banda Oriental it is its own workman. 'During the open day, but more especially in the evening,' says this acute observer, 'these birds may be seen in every direction, standing frequently by pairs on the hillocks, near their burrows. If disturbed, they either enter the hole, or, uttering a shrill harsh cry, move with a remarkably undulatory flight to a short distance, and then turning round, steadily gaze at their pursuer. Occasionally in the evening they may be heard hooting. I found in the stomachs of two which I opened, the remains of mice, and I one day

saw a small snake killed and carried away. It is said that these little animals are their common prey during the daytime. I may here mention, as showing on what various kinds of food owls subsist, that a species that was killed among the islets of the Chonos Archipelago had its stomach full of good-sized crabs.' ('Journal of Researches in Geology and Natural History.')

Of Australian Owls Mr. Gould describes and admirably figures four species of the genus *Strix*, and six of the genus *Athene*, none of which are European. The *Strix delicatulus*, Gould, appears to be the *Strix flammea* of Vigors and Horsfield, in 'Linn. Trans.,' vol. 15.

Fossil Owls.—Remains of fossil owls have been found in the gypsum of the Paris basin, in company with extinct species of extinct genera of *Pachydermata*, and extinct species belonging to existing genera of *Carnivora*, *Marsupialia*, *Rodentia*, and of other birds referrible to the Buzzard, Quail, Woodcock, Sea-Lark (*Tringa*), Curlew, and Pelican, Reptiles (fresh-water tortoises and crocodiles), and Fishes.

STRING-COURSE, a projecting *course* of masonry forming a *string*, or horizontal line on the face of a wall, and consisting of a series of mouldings, as in Gothic, or a flat surface (either plain or enriched), as in Italian architecture. In Gothic architecture, the upper surface of a string-course is almost invariably splayed or sloped in order to shoot off rain, the projection being usually such that the wet would else lodge upon it. The string-course itself consists sometimes of only a few narrow and plain mouldings, at others of a variety of them separated by one or more considerable hollows. In the later or perpendicular style of Gothic, the string-course is frequently made a broad tablet, not only richly moulded, but ornamented with sculptured blocks, heads of animals, shields, &c., placed at intervals in the principal cavetto or hollow. In Italian architecture, the string-course (*Fascia*, Ital.; *Cordon*, French; *Band*, German) is either quite plain, or more or less decorated according to the character of the floor to which it belongs.

STROKESTOWN. [ROSCOMMON.]

STRO'MBIDÆ, a family of Marine Testaceous Gastropods, belonging to the *Alata* of Lamarck and the *Angyostomata* of De Blainville.

The genus *Strombus* of Linnæus is placed in the 'Systema Naturæ' between *Buccinum* and *Murex*; and is divided into the following sections:—*Digitati*, *Lobati*, *Ampliati*, and *Turriti*.

Lamarck's family of *Alata*, or Winged Zoophagous Trachelipods, stands between the *Canalifera* and *Purpurifera*. The *Alata* consist of the genera *Rostellaria*, *Pteroceras*, and *Strombus*.

Cuvier arranges *Strombus* next to *Turbinella*, and at the end of his *Pectinibranchiate Gastropods*. He defines the genus *Strombus*, Linnæus, as comprising shells with a canal which is either straight or inflected towards the right, the external border of whose aperture dilates with age, but always preserves a sinus towards the canal, under which the head of the animal passes when it extends itself. The greater part have, he adds, this sinus at some distance from the canal.

Cuvier nearly follows Lamarck in the subdivisions of the genus.

Of the *Strombi*, properly so called, he says that the external border or lip dilates into a wing, which is more or less extended, but not divided into digits. Their foot is small in proportion, and their tentacles carry their eyes on a lateral pedicle, stouter than the tentacle itself. The operculum is horny, long, and narrow, carried on a slender tail.

The *Pteroceratæ* he characterises as having the external lip divided in the adult into long and slender digitations, varying in number according to the species. The animal is the same as in the *Strombi* properly so called.

The *Rostellariæ*, he remarks, have, in general, a second canal re-ascending along the spire, and formed by the external lip and by a continuation of the columella. In some the lip is still digitated. The animal resembles that of *Murex*, but carries only a very small operculum. Others again have no more than dentilations on the edge of the lip, and others have the lip entire.

Mr. Swainson defines the *Strombidæ*, *Wing-Shells*, which, in his arrangement, stand between the *Turbinellidæ* and the *Volutidæ*, thus:—

'Outer lip dilated, or thickened internally, or detached from the preceding whorl by a sinus; operculum small.'

He makes the family consist of the following subfamilies:—*Strombinæ*, *Conincæ*, *Columbellinæ*, *Pleurotomimæ*, and *Cerithinæ*.

Mr. J. E. Gray makes the *Strombidæ* (the first family of his section *Ctenobranchiata*, Order 1, *Zoophaga*) include the following genera: *Strombus*, *Terebellum*, *Pteroceras*, *Rostellaria*, and *Seraphys*.

Of the *Strombidæ* we here notice only the genera and subgenera *Strombus*, *Pteroceras*, and *Rostellaria*.

The genus *Strombus* ... tributed throughout the seas of warm climates; some ... are Indian, others inhabit the equatorial regions: they vary in the depth of their habitat from 0 to 13 fathoms. Habits carnivorous. The animal is furnished with a long proboscis, at the extremity of which is the mouth, containing a lingual rib, and furnished with sharp points curved backwards.

Examples, *Strombus latissimus*, &c.

The species of the genus *Pteroceras* are littoral in their habits, and are found in the Indian seas. Carnivorous.

Examples, *Pteroceras scorpius*, &c.

Of the genus *Rostellaria*, most inhabit the Asiatic seas. Some however, as *Rostellaria Pes Pelecani* and *R. Pes Carbonis*, are found in the Mediterranean and other European seas. Carnivorous.

Examples, *Rostellaria curvirostris* (*Strombus fusus*, Linn., the *Spindle* of Collectors).

Fossil Strombidæ occur in various formations, as the arenaceous limestone of Bognor, the Bath and inferior oolite, the gault, Kent, the lower green sand of Sussex, &c.

STROMBOLI. [LIPARI ISLANDS.]

STROMNESS. [ORKNEY ISLANDS.]

STRO'NTIUM, a peculiar metal, formerly supposed to be identical with Barytes, but Dr. Hope

in 1792 proved them to be distinct bodies. It has not a very high lustre, appears fixed, is fusible with difficulty, and is not volatile. When exposed to the air it attracts oxygen, and becomes converted into *Strontia*. When thrown into water, it decomposes it with great violence, producing hydrogen gas, and forming with the water a solution of strontia.

Oxygen and Strontium readily unite, constituting the *protoxide*, or *Strontia*, which exists largely in nature; and the *peroxide*, which is entirely an artificial product. *Strontia* ($S^1 O^1$) has a grayish white colour; it is very infusible, not volatile, has an acrid taste, and has an alkaline reaction on vegetable colours. When exposed to the air it attracts carbonic acid, and is reconverted to the state of carbonate. It forms two different compounds with water. The *peroxide* ($S^1 O^2$) may be obtained by passing oxygen gas over strontia at a red heat, or by heating it with chlorate of potash.

Chlorine and Strontium combine to form only one compound, the *Chlorids* (S^1 Chl^1) obtained in long slender crystals, which consist of 1 equivalent of chloride 80 + 1 equivalent of water 9. When exposed to heat the water is expelled, and a solid white chloride remains. The crystals deliquesce in a moist atmosphere, are soluble in twice their weight of water at 60°, and still more so in boiling water. This salt is soluble also in alcohol, and the solution when burning exhibits the peculiar red flame characteristic of the compounds of this base.

Fluoride of Strontium is an insoluble pulverulent compound. *Sulphuret of Strontium* appears in crystals. *Carbonate of Strontia*, or *Strontianite*, was the first discovered compound of strontia; it occurs both crystallised and massive. The primary form of the crystal is a right rhombic prism; it is moderately hard, variously coloured, and translucent. *Stromnite*, or *Barystrontianite*, or *Barytiferous Carbonate of Strontia*, is a mineral found at Stromness in Orkney. It is a softish, brittle, translucent, grayish substance. *Carbonate of Strontia* may be artificially obtained by several processes. It is a colourless insipid powder, quite insoluble in water, decomposed by acids with effervescence, and by exposure to a high temperature. *Sulphate of Strontia*, or *Celestin*, occurs as right rhombic, hard, brittle, variously-coloured, translucent crystals; and also in uncrystallised masses. *Sulphate of Strontia and Barytes*, or *Grunerite*, is a hard, white, translucent, uncrystallised mineral. *Sulphate of Strontia* may be obtained artificially, by adding sulphuric acid, or a sulphate, to any soluble salt of strontia. It is a colourless, insipid, heavy powder, insoluble in water, and dissolved only by strong, sulphuric acid, from which it is precipitated by water. *Nitrate of Strontia* has the form of octohedral crystals.

The salts of strontia are occasionally used in chemical investigations, and in giving a purple flame to fire-works.

STROOD. [ROCHESTER.]

STROPHE (στροφή) is a set of verses composed according to a certain system of metres. The word is derived from στρέφω, 'to turn,' for in the lyric poetry of the Greeks, especially the choral, this part of a poem was sung during the movements and dances of the chorus. In modern times such a combination of verses written either in the same or in different metres, is commonly designated by the Italian name *Stanza*. The division of a poem into strophes was however applied by the ancients only to lyric poetry, and here one strophe seldom exceeded the number of four verses, with the exception of the dramatic and other choruses, in which a strophe sometimes contains a considerable number of verses. However different the metre of the several verses may be, there is always a unity of rhythm in them which characterises a strophe as an artistic whole. The antistrophe corresponds in its metre to the strophe; the epode differs from both, and forms the concluding stanza of a chorus.

STRO'PHULUS is an eruption of pimples upon the skin, which frequently occurs in infants whose health is disordered by the irritation of teething or any other cause. Dr. Willan describes the following forms of the disease:—

1. *S. intertinctus*, of which the vulgar name is Red-Gum or Red-Gown. 2. *S. albidus*. 3. *S. confertus*, often called the Tooth-Rash, and the Rank Red-Gum. 4. *S. volaticus*. 5. *S. candidus*. These diseases require no active treatment; and cease with the irritation from which they have their origin.

STROUD. [GLOUCESTERSHIRE.]

STRUENSEE, JOHANN FRIEDRICH, GRAF VON, was born at Halle in Saxony, Aug. 5, 1737. His father, a divine of some eminence, was professor of theology at the university of Halle, where the son entered in 1754, and applied himself to physic. He obtained his degree of doctor in medicine in 1757. In the same year his father was made pastor primarius at the principal church of Altona, in which town young Struensee himself obtained the appointment of public physician. Singular success attended him in the practice of his profession, and shortly after his arrival a few literary productions procured him the reputation of an author. He remained in this situation after his father's removal to Rendsburg in 1760, where he had been appointed superintendant-general of Schleswig and Holstein. It does not appear when he left Altona; but in 1768 we find him appointed to attend the King of Denmark, Christian VII., in his tour through Germany, France, and England. Struensee soon insinuated himself into the good graces of the King, with whose profligacy the loose principles and easy manners of his new physician were in perfect accordance. Soon after their return to Copenhagen the King himself presented Struensee to the Queen Caroline Matilda, the posthumous daughter of Frederic, Prince of Wales, and sister of George III., and promoted him to the rank of privy counsellor. In his capacity of render to the King, Struensee found ample opportunities of realising his ambitious plans. In order to supplant Count Bernstorff, or rather, to deprive him of his seat in the council of state, he recommended Count Rantzau-Aschbach. Soon afterwards he obtained the recall of his friend *Enewold von Brandt*, the King's chamberlain,

who had been banished for calumniating Count von Holk, but who was now raised to the dignity of Maître des Plaisirs and director of the plays. Struensee promoted and apparently effected a more cordial agreement between the King and Queen; Count Bernstorff and many other men of quality were dismissed from power; and the Queen Dowager Juliana Maria found herself neglected by her friends and slighted by her enemies. The triumph of Queen Caroline was complete; the King behaved to her with deference, and Struensee was now constituted first minister, with almost unlimited power. Thus matters stood at the end of 1770; and in order to be in perfect security, Struensee assigned to Brandt the special office of amusing the King and preventing him from having any conference with his ministers.

It was about this time that the King, urged by Struensee, dissolved the council of state, and instituted in its place a commission of conference (*Commissions Conferenz*), which consisted of the presidents of the several branches of public administration. This measure brought all the power into the hands of the prime minister, by whom the members of this new council had been appointed. Struensee's authority now became paramount, and no one ventured to oppose him. All this time the court was plunged into a profligacy which offended the nation, and the popular dissatisfaction was increased by oppressive taxation. Meanwhile the entire confidence of the Queen in Struensee was quite unconcealed, and when, after the birth of a princess in July, 1771, she learned that rumours prejudicial to her character were abroad, and likely to spread to the court of the Queen-Dowager at Friedensburg, she sunk still more into the power of Struensee, which power he shamefully abused. But though the Queen's fears made her silent, it was not so with the press. Its comments on Struensee's proceedings could not be silenced, except by revoking the freedom which he had granted only two years before. An unimportant mutiny of 300 sailors who had not received their pay had already shaken Struensee's firmness, and was followed by a revolt of the life-guards, whom he had dismissed without any cause. The partisans of Juliana Maria and her son Prince Frederic regarded the critical position of the minister as an opportunity for a coup d'état too favourable to be neglected. They planned a conspiracy, and on the morning of Jan. 17, 1772, Queen Matilda, Struensee and his brother Karl, Brandt, and all their friends and adherents, were arrested. The unfortunate Queen was brought to Kronenburg, where she was confined until the end of May, 1772, when she was set at liberty through the influence of the English government, and was removed to Zelle.

Meanwhile a special commission was formed, in order to try Struensee, by which he was condemned and sentenced, April 25, 1772, to be deprived of all his dignities and beheaded. His right hand was to be cut off, his body quartered and broken on the wheel, and his head and hand were to be stuck up on a pole. This sentence was confirmed by the King in every point; and Struensee was decapitated, April 28, after witnessing the death of his friend Brandt. The life of Brandt, from the period of his recall, was but a copy of that of the prime-minister. He was violent and imprudent, and once so much forgot himself as to strike the King. The sentence pronounced on him was similar to that of Struensee.

Karl August von Struensee, the elder brother of Johann Friedrich, had been appointed councillor of justice at Copenhagen. He had fulfilled its duties so irreproachably that he was set at liberty after a short confinement, and returned to Germany. He held some important offices in Prussia, and died Oct. 17, 1804. He was the author of 'Rudiments of Artillery,' Leipzig, 1760; 'Rudiments of Military Architecture,' 1771; and 'A Short Description of the Commerce of the principal European States.'

STRUTHIO'NIDÆ, a group of terrestrial birds, of which the Ostrich is the type. In these birds the wings are not sufficiently developed to subserve the purposes of flight, and the great locomotive energy is thrown into the lower extremities, the deficiency of the anterior limbs being to a certain degree compensated for by the development of the latter. It must not however be supposed that all birds destitute, from organic configuration, of the powers of flight belong to the *Struthionidæ* (whether this group be considered as an order or a family). Setting aside the paddle-winged aquatic birds, as the Penguins of the Southern Ocean, and the Great Auk (*Alca impennis*) of the Arctic latitudes, there are others of terrestrial habits which do not come within the limits of the *Struthionidæ*. Indeed it is more than probable, that in remote ages various forms of wingless or rather wing-powerless birds existed, of which many are referrible to no existing type; and moreover that we may regard the extant brevipennate or nonvolitant terrestrial birds, as the representatives of a subclass of birds, once abounding in families, genera, and species, which has become extinct on the surface of our globe.

If the opinions lately advanced, and with no little acumen, by Mr. Strickland and Dr. Melville, be true, we have two, three, or even more birds of brevipennate structure, and of comparatively recent extinction, which belong to the group of the *Columbidæ* (family or order of Pigeons). On this subject see DODO and SOLITAIRE. Besides which it does not appear that the extinct brevipennate birds of New Zealand [DINORNIS] are all if any referrible to the *Struthionidæ*; nor, if we consider the structure of the beak, and the burrowing and nocturnal habits of the two extant species of *Apteryx* (*A. Australis*, Shaw, and *A. Owenii*, Gould), both natives of New Zealand (but formerly, with extinct forms, as there is every reason to believe, spread over a wide continental region now almost submerged), shall we without hesitation refer them to the *Struthionidæ*. However, as Mr. Gould arranges them under this family head, we shall not here exclude them.

Those who wish for anatomical information respecting the structure of this singular family or group may consult Professor Owen's paper on the 'Anatomy of the Apteryx,' in the 2nd. vol. of

the 'Trans. Zool. Soc. Lond.;' and Sir E. Home's 'Lectures on Comp. Anatomy.'

The recognised species of the living *Struthionidæ* are as follows:—The Ostrich (*Struthio Camelus*), the Cassowary (*Cassuarius Casoar*, Briss.), the Rhea (*Rhea Americana*), Darwin's Rhea (*Rhea Darwinii*, Gould), the Emeu (*Dromaius Novæ-Hollandiæ*), and two species of Apteryx (*Apteryx Australis* and *Apteryx Owenii*, Gould).

Among these birds, the true wing-bones are best developed in Rhea, and next in the Ostrich. In the Cassowary, Emeu, and Apteryx, the lowest development of these bones is exhibited. The brain is tolerably well developed in Struthious Birds, and the senses of taste, smell, sight, and hearing are in considerable perfection. In the Apteryx, as Professor Owen observes, its nocturnal habits, combined with the necessity for a highly-developed organ of smell, which chiefly compensates for the comparatively low condition of the organ of vision, produce the most singular modification which the skull of that bird presents; insomuch that those cavities, which in other birds are devoted to the lodgment of the eyes, are in the Apteryx almost exclusively occupied by the nose; nevertheless the eye is well formed, though small, and the powers of nocturnal vision are very acute.

1. *The Ostrich.*—This well-known bird is the Στρουθοκάμηλος (Struthocamelos) of the Greeks, *Struthiocamelus* of Pliny and the Romans, *Struzzo* and *Struzzolo* of the Italians, *Strauss* of the Germans, *Autruche* of the French, and *Struthio Camelus* of Linnæus.

The Ostrich is a native of Africa, Arabia, and the great wilds of Syria. It feeds upon grain, seeds, and vegetable substances, probably not to the exclusion of insects and small reptiles. Several females lay their eggs in a common nest, namely a large shallow pit in the sand, with a margin of sand thrown up around it. In some districts, where the atmospheric temperature is considerable, the incubation of the female, except at night, is unnecessary; but in cooler latitudes she performs the maternal office with assiduity, and, if Le Vaillant be correct, is relieved by the male during the night. The eggs are accounted delicacies; and among the epicures of ancient Rome dishes of the brains of ostriches were in great estimation. The wing-plumes are a material article of commerce. The voice of the ostrich is under ordinary circumstances a hoarse sonorous sort of chuckle, but it is said to utter, especially at night, a roaring so like that of the lion, as to deceive the Hottentots. The young ostrich is covered with coarse mottled and striped plumage of a blackish brown and yellowish white, the feathers of the back having the shafts dilated into a thin horny tip. The ostrich will swallow stones, leather, cordage, glass, iron, or almost any inorganic substance.

2. *The Cassowary.*—This well-known bird was named *Emeu* by the early Portuguese navigators. It is the *Struthio Casuarius* of Linnæus, *Casuarius galeatus* of Vieillot, and *Cassowary* of the British naturalists, who now apply the term *Emeu* to the Australian Cassowary (*Dromaius*, Vieill.). Its height when erect is about five feet.

Geographical Distribution.—The peninsula of Malacca and the great chain of islands to the south and east. Bontius notes it from Ceram and the other neighbouring Molucca Islands. M. Lesson observes that it is very common in the islands of the Asiatic Archipelago, and especially at New Guinea. It is frequently seen alive in our menageries, and is common in museums.

Food, Habits, &c.—This species, which is characterised by M. Lesson as 'stupid and massive,' feeds on seeds and herbage according to him; but Cuvier says that it eats fruits and eggs, but no grain. When irritated, it does not rush forward to the attack, but turns itself obliquely, kicking backwards at the enemy. Cuvier observes that the featherless quills serve the bird for offensive weapons. Bontius remarks that the eggs are very different from those of the ostrich, by reason of their thinness and colour, for their shell is greenish, ornamented with numerous tubercles of a deeper green: he adds that they are eaten by the natives. Cuvier relates that the bird lays a small number of green eggs, which it abandons, like the ostrich, to the heat of the climate.

3. *The Rhea*, or American Ostrich, and *Darwin's Rhea.*—The Nandu, or Common Rhea has been long known, and has been described by Marcgrave, Piso, and others, but by none so correctly and graphically as by Mr. Darwin, in his 'Journal.' He states that it abounds on the plains of La Plata, and is occasionally found in Paraguay. Its food consists of roots, grass, &c., and also of small fish, washed up on the mud-banks of rivers. It is shy, wary, and fleet, preferring to run against the wind. It takes freely to the water, and swims with ease across rivers, having even a rapid current. The note uttered by the male is a deep-toned hissing. It appears that the male alone incubates the eggs, and that several females lay in one shallow excavation, the total number of eggs varying from 20 to 50. But besides the eggs deposited together in the nest, others are found scattered in great numbers over the plain, where they lie or become putrid. This circumstance, which may appear strange, *may* arise, as Mr. Darwin suggests, from the difficulty in several females associating together, and in finding a male ready to take the office of incubation. It is evident that there must at first be some degree of association between at least two females, otherwise the eggs of each would be deposited at distances far too great to allow of the male collecting them into one nest. Previous then to the association of two or more females, the eggs they lay are dropped over the plain; but when the partnership takes place they make a common nest. Height in the natural attitude about five feet; generally seen in pairs, but sometimes in flocks of thirty.

Darwin's Rhea, or the *Avestruz Petise*, is considerably smaller than the preceding species, and is chiefly confined to Southern Patagonia, where it takes the place of the Nandu in Northern Patagonia, and the plains of La Plata. Like the

Nandu it takes to the water, and is said to prefer the plains near the sea.

Darwin's Rhea (*Rhea Darwinii*).

'Among the Patagonian Indians in the Strait of Magellan,' says Mr. Darwin, 'we found a half-bred Indian, who had lived some years with his tribe, but had been born in the northern provinces. I asked him if he had ever heard of the Avestruz Petise. He answered by saying, "Why there are none others in these southern countries." He informed me that the number of eggs in the nest of the Petise is considerably less than with the other kind, namely, not more than fifteen on an average; but he asserted that more than one female deposited them. At Santa Cruz we saw several of these birds. They were exceedingly wary. I think they could see a person approaching, when he was so far off as not to distinguish an ostrich. In ascending a river, few were seen; but in our quiet and rapid descent, many in pairs, and by fours or fives, were observed. It was remarked by some of the officers, and I think with truth, that this bird did not expand its wings, when first starting at full speed, after the manner of the northern kind.'

Mr. Darwin picked up eggs of this species on the plains of Patagonia, and observes that they are little less than those of the common species, but of somewhat different form, with a tinge of pale blue.

4. *The Emeu, Emu, or Australian Cassowary, Dromaius Novæ Hollandiæ* of authors, *D. Ater* of Vieillot, and *Dromiceius Australis* of Swainson, has become quite familiar to us from the frequency of its exhibition in menageries, and its breeding so readily in a state of domestication. The food of the Emeu consists of vegetables and seeds, but chiefly of fruits, roots, and herbage. In a state of nature it is very fleet, and affords excellent sport in coursing with dogs, which are however rather shy of their game, in consequence of the powerful kicks that the bird can inflict, so powerful that the settlers say it can break the bone of a man's leg by striking out with its feet. Well-trained dogs therefore, to avoid this infliction, run up abreast, and make a sudden spring at the neck of the bird. Though the Emeu has bred so frequently in captivity, the mode of making the nest in the wild state does not appear to be well known, though it is generally supposed to be a mere hollow excavated in the earth. The dark green eggs are six or seven in number. The birds appear to be tolerably constant in pairing, and the male bird sits and hatches the young, whilst the female watches and guards the nest. The Emeu can produce a hollow drumming sort of note, well known to those who have attended to its manners in captivity. These birds will, like the *Rhea*, take water. Captain Sturt, when descending the Murrumbidgee, in Australia, saw two of them in the act of swimming. They appear to be gregarious, and not very shy in some localities, for Major Mitchell in his excursion toward Port Philip found them very numerous on the open downs, and their curiosity brought them to stare at the horses of the party, apparently unconscious of the presence of the riders. In one flock he counted thirty-nine, and they came so near that the traveller, having no rifle with him, was tempted to discharge a pistol at them, but without effect.

The Emeu is diffused over the southern part of Australia and the neighbouring islands; but is gradually disappearing before the encroachment of civilised man. They have also been observed on the west coast (Swan River). Captain Flinders found them in abundance at Port Philip and King George's Sound, and D'Entrecasteaux at the latter place. Flinders and Péron saw them in numbers on Kangaroo Island.

The flesh of the Emeu, particularly the hind quarters, is generally described to be good and sweet eating.

There is every reason, as Mr. Gould informs us, to believe, that a second and smaller species exists in the remoter districts of Australia.

5. *The Apteryx*, or Kiwi-Kiwi of the aborigines of New Zealand. Two species of this singular form are now known; a form which we admit with hesitation among the family *Struthionidæ*.

For a detailed description of these two birds, namely, *Apteryx Australis*, Shaw, and *Apteryx Owenii*, Gould, we refer to Mr. Gould's magnificent work on the 'Birds of Australia,' and 'Proceeds. Zool. Soc.,' 1848. In their food and habits they appear to be very similar. The diet consists of insects, worms, snails, &c.

With respect to the Kiwi-Kiwi, or Apteryx, first described by Dr. Shaw from a specimen brought home in 1812, Mr. Gould observes that its favourite localities are those covered with extensive and dense beds of fern, among which it conceals itself, and when hard pressed by dogs, the usual mode of chasing it, it takes refuge in crevices of the rocks, hollow trees, and in the deep holes which it excavates in the ground in the form of a chamber. In these latter situations, Mr. Gould tells us, it is said to construct its nest of dried fern and grasses, and there deposits its eggs, the num-

her and colour of which have not been clearly ascertained.

Mr. Short, in a letter to Mr. Yarrell, states that when undisturbed, the head is carried far back on the shoulders, with the bill pointing to the ground; but when pursued, it runs with great swiftness, carrying the head elevated like the ostrich. Its habits are said to be almost exclusively nocturnal, and the natives usually hunt it by torchlight, seeking for it with the utmost avidity, the skins being highly prized for the dresses of the chiefs, and indeed the natives can be rarely induced to part with them. When attacked it vigorously defends itself, striking rapidly and dangerously with its powerful feet and sharp spur, with which it is also said to beat the ground, in order to disturb the worms, on which it feeds, seizing them with its bill the instant they make their appearance.

The *Apteryx* is said to inhabit all the islands of New Zealand, particularly the southern end of the middle island.

STRUTT, JOSEPH, was born at Springfield, in Essex, Oct. 27, 1749. At the age of 14 he was apprenticed to Ryland, the engraver, and afterwards became a student of the Royal Academy. In 1771 he became a student in the reading-room of the British Museum, the manuscript stores of which gave a new bias to his pursuits. In 1773 he published his first work, 'The Regal and Ecclesiastical Antiquities of England, containing the Representations of the English Monarchs from Edward the Confessor to Henry VIII.' In 1774 the first volume 4to. of 'Horda Angel-Cynnan, or a complete View of the Manners, Customs, Arms, Habits, &c., of the Inhabitants of England, from the arrival of the Saxons,' the second volume of which appeared in 1775, and the third in 1776. In 1777 and 1778 he published a 'Chronicle of England,' in 2 vols. 4to. His next work was 'A Biographical Dictionary, containing an Account of all the Engravers from the earliest period to the present time, illustrated by engravings,' 2 vols. 4to., London, 1785 and 1786.

In 1795, after four or five years residence in Hertfordshire, he returned to London, and began collecting materials for his 'Complete View of the Dress and Habits of the People of England, from the establishment of the Saxons in Britain,' the first volume of which he published in 1796, and the second in 1799. In 1801 he published the last work he lived to complete, 'The Sports and Pastimes of the People of England,' 4to. He died, in narrow circumstances, Oct. 16, 1802. He left some manuscripts in the possession of his son, from which 'Queen Hoo Hall,' a romance, and 'Ancient Times,' a drama, in 4 vols. 12mo.; and 'The Test of Guilt, or Traits of Ancient Superstition, a dramatic tale, with the Bumpkin's Disaster,' &c., 4to., have been since published.

Nichols, in his 'Literary Anecdotes,' enumerates a considerable number of single plates which Mr. Strutt engraved and published, as well as a few paintings in oil and drawings.

STRY, CIRCLE OF. [GALIZIA.]

STRY'CHNIA, a vegetable alkali obtained from the *Strychnos Nux-vomica*, in which it exists combined with *Strychnic Acid*. It is colourless, inodorous, crystalline, unalterable by exposure to the air, and extremely bitter. It acts like other alkalies on vegetable colours, and neutralise sand forms salts with acids. It is extremely poisonous; one-eighth of a grain is sufficient to kill a dog, and a quarter of a grain produces a dangerous effect upon a man. It is composed of C^{30} H^{16} O^3 N^1.

STRYCHNIC ACID. This acid exists in the *Strychnos Nux-vomica* in combination with Strychnia. It is soluble both in water and in alcohol, and is composed of H^{16} C^{30} O^3 N^1.

STRYCHNOS, a name applied by Theophrastus and Dioscorides to a kind of nightshade, and adopted by Linnæus for a genus of plants belonging to the natural order *Apocynaceæ*. The species are not numerous, and are found principally in the tropical parts of Asia and America. One has been described by Mr. Brown a native of New Holland. *Strychnos Nux-vomica*, Poison-Nut, or Ratsbane. The wood of this plant is very hard and durable, and on that account is applied to many purposes by the natives on the coast of Coromandel and other places where it grows. *Strychnos Nux-vomica* is a native of Coromandel, Malabar, Ceylon, and other parts of India, growing in sandy places, and attaining the size of a tree, but short, crooked, and sometimes twelve feet in circumference, flowering in the rainy season. The fruit is about the size of a St. Michael's orange, with a bitter astringent pulp, and containing (according to Sir Whitelaw Ainslie) from three to five seeds. The pulp may be eaten, but the seeds are poisonous and officinal. *S. potatorum*, Clearing-Nut, is an abundant plant in the woods and mountains of the East Indies. It has shining fruit, which is black when ripe. The English name is derived from the use which is made of the seeds, which, when dried, are sold by the natives for the purposes of clearing muddy water. *S. St. Ignatii*, St. Ignatius's Bean, is a climbing shrub, without tendrils, bearing long drooping white flowers, which have the scent of jasmine. This species is the *Ignatia amara* of Linnæus, but has been referred to the present genus by later botanists. It is a native of Cochin-China, the Philippine Islands, and other parts of Asia. *S. colubrina*, Snake-Wood, or Snake-Poison-Nut, is a native of the coast of Coromandel and of Silhet. It has small greenish-yellow flowers, and fruit as large as an orange, of a yellowish colour. It is considered by the Indian doctors as an effectual remedy for the bite of the *Cobra de Capella*, a well-known poisonous snake. For this purpose it is used both externally and internally. *S. Tieute*, Tjettek or Upas Tieute, is a climbing shrub, and is a native of Java, and is said to be the true Upas-Tree of that country. It is undoubtedly the most poisonous species of the genus, and yields the greatest quantity of strychnia. *S. toxifera*, Wooraly, *Urari*, or Poison Plant of Guiana, is a native of Guiana, and was lately brought to this country by Sir R. Schomburgk. It had long been suspected that the poison used by the American Indians for their arrows was a species of Strychnos, but such is the secrecy with

which they gather the plant and prepare the poison, that all inquiries have been frustrated. Mr. Schomburgk's long stay in Guiana has enabled him to decide this point: by bribing some of the natives, he induced them to guide him to a spot where their famous Urari flourished, and on arriving at the place, found it to be the species of Strychnos above described. In the preparation of the poison, the Urari is not the only ingredient, but forms about half of the bulk of the ingredient used. For a full account of the discovery of this plant, and the mode of making the poison, with its effects on the animal economy, the reader is referred to Mr. Schomburgk's account of the Indian Arrow-Poison. ('Annals of Natural History,' vol. vii., p. 407.) *S. pseudo-quina*, Quina do Campo, is a native of Brazil, and forms a scrubby plant about 12 feet high, with a corky bark. The fruit of this species is eaten by the native children.

STRYCHNOS NUX-VOMICA, *Medical Properties of.*—There is a difference of susceptibility to the action of Nux-Vomica in different classes of animals, since a much larger quantity is necessary to destroy herbivorous than carnivorous animals.

Three distinct degrees of action may be observed from the use of Nux-Vomica. In small doses the ganglionic system appears chiefly to be affected, and this so slightly, that any phenomena are observed only in cases of disease, particularly in hysterical and weak persons. The secretions are increased, both of the intestinal canal, the liver, the kidneys, and of the skin, accompanied with an increase of appetite and improved digestion.

It is in the second degree of action that the characteristic effects of Nux-Vomica begin to appear. The patient experiences a feeling of weight and weakness in the movements of the limbs, inducing him to remain at rest; while his mind is restless, sad, depressed, and anxious for solitude and darkness, as he is peculiarly sensitive to light, noise, or the movement of the surrounding objects. With an augmentation of the dose, these phenomena are increased, and the contact of any external body causes a feeling like an electric shock. The voluntary muscles are no longer under the control of the will, and the individual staggers on the least attempt at walking.

The third degree of action manifests itself by tetanus and asphyxia, occurring in single paroxysms, alternating with paralytic torpor. The paroxysms become longer and the remissions shorter, in which however, till death close the scene, the intellect remains unaffected. Vomiting does not always occur, though the name would seem to imply the frequency of this symptom.

The powerful properties of Nux-Vomica, and the rapidity of its action when administered in the state of a pure alcaloid, strychnia, or its salts, have deterred medical men from making so extensive a use of it as its therapeutic qualities entile it to.

In paralysis it has been found more uniformly beneficial than most other remedies, though success has not always attended its employment. It is certainly better suited for some forms of paralysis than for others.

It is most serviceable in cases of paralysis of parts which derive their nerves from the ganglionic system or spinal chord. Hence it is more serviceable in paraplegia than hemiplegia, in palsy of the bladder, of the rectum, and even in some cases of chronic diarrhœa dependent on atony of the intestines. It is more serviceable in the palsies which follow fevers, rheumatisms, repelled eruptions, habitual drunkenness, and exposure to noxious metals, such as lead or mercury, and merely depressed nervous power, than in those which result from effusion of blood.

In cases of poisoning by Nox-Vomica, the most prompt treatment is necessary, and still more so if any of the soluble salts of strychnia shall have been taken. Nox-Vomica is occasionally made the instrument of voluntary death, although no poison causes such torture. The stomach-pump should instantly be had recourse to, when Nux-Vomica has been taken in powder, and as it adheres very obstinately to the coats of the stomach, it must be perseveringly used, with plenty of water. Emetics are too tedious in their action to be depended upon.

On account of the difficulty of preparing the alcoholic extract of Nux-Vomica of uniform strength, Strychnia, or some of its soluble salts, is now generally substituted for it, as these admit of easy subdivision of the dose. Sulphate of Strychnia has been used in some cases with great advantage; so also the acetate: but a form of preparation which has proved of service in some long-standing and almost hopeless cases of paralysis is the Hydriodate of Strychnia.

STRYPE, the REV. JOHN, was born in London, Nov. 12, 1643. After having been six years in St. Paul's School, he was admitted, in 1661, of Jesus College, Cambridge, but removed to Catherine Hall. He took his degree of B.A. in 1665, and M.A. in 1669. In 1669 he was presented to the perpetual curacy of Theydon-Boys in Essex, which he resigned after a few months upon being appointed vicar of Low Leyton in the same county. Here he resided till he went to Hackney, a few years previous to his death. He was lecturer of Hackney till he resigned that appointment about the year 1724; and held the sinecure of Terring in Sussex, to which he was presented by Archbishop Tennison. He died Dec. 13, 1737.

Although Strype's works amount to thirteen large folio volumes, besides octavos and pamphlets, it was only in his forty-sixth year that he began with a single sermon; nor did he print anything more till five years afterwards. Then, in 1694, appeared, in a folio volume, his 'Memorials of Cranmer.' This was followed, in 1698, by the 'Life of Sir Thomas Smith,' secretary of state to Edward VI. and Elizabeth. In 1701 he published his 'Historical Collections relating to the Life and Acts of Bishop Aylmer,' and this was followed by his 'Life of Sir John Cheke,' 8vo., London, 1705. In 1709 he brought out the first volume in folio of his 'Annals of the Reformation and Establishment of Religion.' Before proceeding further with this work he produced his 'History of the Life and Acts of Archbishop Grindal,' in 1710; his 'Life and Acts of Archbishop Parker,' in

1711; and his 'Life and Acts of Archbishop Whitgift,' in 1718. Then, digressing to another field of antiquarian investigation, he came forth, in 1720, with his new edition of Stow's 'Survey of London,' in two bulky folios, of which we may safely say that nearly three-fourths consist of his own additions. The next year, 1721, was published what may be regarded as his most important work, his 'Ecclesiastical Memorials.' But Strype's labours were not yet closed: a second volume of his 'Annals' appeared in 1725; a third in 1728; and a fourth in 1731.

Strype claims the merit, and with considerable justice, of great fidelity and accuracy. His books, though somewhat prolix and dull, are all curious, and valuable for the quantity of information they contain never before published, and not easily to be elsewhere found.

STUART FAMILY. The earliest member of this family whom we find on record is Walter, son of Alan, who was Stewart, or *Dapifer*, of Scotland in the reigns of David I. and Malcolm IV. He was succeeded in that office by his son Alan; this Alan by his son Walter; Walter by his son Alexander, who was one of the regents appointed during the minority of Alexander III., and who, in 1263, commanded the Scottish army at the battle of Largs. Alexander was succeeded by his son James, who was regent after the death of Alexander III., and died in 1309; and he was succeeded by his son Walter, the father of ROBERT II. The list of kings of Scotland of this family from Robert II. of Scotland to James VI. of Scotland and I. of England, is given in the article SCOTLAND. The Acts of Settlement, passed in the reign of William III., secured the succession of the House of Hanover to the throne of England, and the descendants of James II. were subsequently excluded from the throne of Scotland also. The chief historical interest that attaches to the House of Stuart after the abdication of James II. is limited to the two invasions of Great Britain by his son and grandson, who are often respectively called the Pretender and the Young Pretender.

James Francis Edward Stuart was born June 10, 1688. His father, James II., died Sept. 16, 1701, and the prince was immediately acknowledged by Louis XIV. of France as king of Great Britain. In 1708 extraordinary preparations were made by Louis at Dunkirk, with the object of invading Scotland. The Pretender's claims were the ostensible reason for this attempt; and he accordingly embarked with the fleet. But the expedition was unsuccessful, partly from storms, which dispersed the French ships, partly from the vigilance of the English admiral, Sir George Byng, but chiefly from the dissensions of Fourbin and Gare, who had the command of the French fleet. It returned to Dunkirk, and the disappointed Pretender obtained permission of Louis to engage in the campaign in Flanders. Upon the death of Queen Anne, who was favourably disposed towards her brother, and who indeed is said to have been cognisant of his expedition to Scotland, James, who had been residing at Bar-le-Duc, posted to Versailles, where he met with an unfavourable reception from Louis XIV., who intimated that he must quit France. In Aug., 1714, James sent to the principal nobility of Great Britain a declaration asserting his claim to the throne. His friends were in the meantime not idle, and on Sept. 6, 1715, the Pretender's standard was set up by the Earl of Mar at Braemar.

A conspiracy was about the same time discovered in England. Treasonable designs were so widely spread in the western counties that at Bath the Jacobites talked openly of the Scotch rebellion as merely a diversion to draw the troops off to the north. The university of Oxford was also tainted with Jacobitism, and King James's health is reported to have been drunk there every day. The decisive measures of the government however promptly suppressed these manifestations.

In the north the next step of the insurgents was to proclaim James king at Newcastle-upon-Tyne, and to make an attempt on the town, which failed. The standard of James VIII. of Scotland was set up at Moffat in Annandale, Oct. 12, by the Earl of Kenmure; and on the 19th the Scots, under Lord Kenmure, being joined by the English rebels, marched to Kelso.

In the meantime the Earl of Mar proceeded to Dunkeld, where the Marquis of Tullibardine and the Earl of Breadalbane joined his troops, with 2000 men. They possessed themselves of Perth, and upon this important town being gained, their force was much augmented. After various successes they attempted to march to Edinburgh; but the Duke of Argyle, the commander-in-chief of the king's forces in Scotland, sending a detachment to prevent their entrance into the capital, the rebels changed their course, and marched into Leith.

They marched southwards to Kelso, Oct. 27, where they were joined by the English and Scottish horse from Nithsdale and Northumberland. But on the approach of General Carpenter from Newcastle, the Pretender's forces marched to Jedburgh, and thence towards Dumfries. The Duke of Argyle was at Stirling with so small a force that, unless he was soon joined by the Dutch or Irish troops, which were expected, he could not save Dumfries. Everything seemed to favour the enterprise of the Pretender; but divisions in the Jacobite council of war frustrated their plans. After some loss of time the rebels marched to Brampton in Cumberland, where the Pretender was proclaimed. They then proceeded to Penrith, and thence, Nov. 5, to Appleby; next to Kendal, to Kirby Lonsdale, and on the 7th to Lancaster, which they entered without opposition. They left Lancaster on the 9th for Preston, where they were compelled to surrender, Nov. 13, to Generals Carpenter and Willes. The number of the English and Scottish prisoners of all classes amounted to 1489. On the same day that Preston surrendered, the battle of Dumblane was fought between the Duke of Argyle and the Earl of Mar. The left wing of the rebels, though they fought bravely, was routed; and towards evening the Duke drew off to Dumblane, and the enemy to Ardoch. On the same day news arrived that the pass of Inverness was gained. This important advantage was

the result of treachery. Lord Lovat had delivered it to the king's troops.

On Dec. 22, the Pretender landed at Peterhead in Scotland, with a train of six gentlemen, among whom was the Marquis of Tynemouth, son of the Duke of Berwick. From Peterhead James proceeded to Newburgh, a seat of the Earl Marischal's; and passing through Aberdeen in disguise to Fetterope, he was met there by the Earl of Mar, who had left Perth with a troop of horse. James now assumed the state of royalty: he formed a court, made several peers, and created knights. In Jan., 1716, the Pretender made a progress through the country. Meantime the Duke of Argyle marched through Auchterarder, to Tullibardine, whilst the Pretender and his followers retreated to Dundee, and thence to Montrose, where the Pretender, Lord Mar, and many other persons of rank, embarked on board a French ship then in the roads, by which they reached Gravelines in a few days.

The Earls of Wintoun, Kenmure, and Derwentwater, of Carnwath, and of Nithsdale, with Lords Widdrington and Nairn, were tried at London. The prisoners of inferior rank were tried chiefly at Lancaster, where many were executed. One thousand of them, upon their petition, were transported to the Plantations in North America. Derwentwater and Kenmure were beheaded on Tower Hill, March 7. Lords Widdrington, Carnwath, and Nairn, were reprieved. The Earls of Nithsdale and Wintoun escaped. After the alliance of King George with France and the United States, James was compelled to quit France, and take refuge in Italy. In 1718 he became the instrument of Cardinal Alberoni's ambitious intrigues. He was advised by Pope Clement XI. to go into Spain, where a squadron had been for some time fitting out against England. James was received with regal honours at Madrid; and the Duke of Ormond was appointed captain-general of the expedition. But a storm dispersed and entirely disabled the Spanish fleet off Cape Finisterre; and a descent which the Spaniards made at Kintail in Scotland (June, 1719), although aided by the Highlanders, was defeated by General Wightman. During the year 1718-19 a marriage was agreed on between the Pretender and Maria Clementina Sobieski, grand-daughter of John Sobieski, king of Poland. Two sons, Charles-Edward and Henry, were the offspring of this union. Maria Clementina died in 1735.

In 1722 the Pretender published at Lucca his famous declaration, addressed to his loving subjects of Great Britain, and to all foreign princes and states, signed 'James Rex.' This document, which, amongst other articles, contained a proposal to George I. to resign his crown, was pronounced by the House of Lords to be a false, insolent, and traitorous libel, and was burnt at the Royal Exchange.

James, during the latter years of his life, resided entirely at Rome, where he led a quiet life, although the hope of ascending the throne of England seems never wholly to have left him. The events of 1745 belong to the history of his eldest son, rather than to the annals of the Pretender's life. He was the last of the Stuarts that received kingly honours. James Stuart died at Rome in 1765. Mr. Leslie, a nonjuring clergyman, who had opportunities of conversing with the Pretender, praises his affability, good sense, freedom from bigotry, and magnanimity.

Charles Edward Stuart, born Dec. 31, 1721, bore the title of Prince of Wales among the Jacobites. He served in Spain under Don Carlos, who paid him great respect and attention. In 1743 Cardinal Tencin, the prime minister of France, combined with the Jacobites in England and Ireland to project a fresh invasion of Great Britain. He persuaded the Pretender to surrender his claims to Charles Edward, and the prince set out, for the coast of Picardy, where an army of 15,000 men was assembled, and transports were provided at Boulogne, Dunkirk, and Calais for carrying the troops to England. The army was to land on the coast of Kent; and at the same time a squadron sailed from Brest to convoy the transports. But the squadron fled before the British fleet under the command of Sir John Norris, a violent storm destroyed most of the transports, and a great part of the troops were drowned (1744). The prince returned to Paris to wait a more favourable opportunity, and the period at which the rebellion of 1745 was undertaken was favourable to its success. Towards the end of May Charles Edward, accompanied by a number of influential gentlemen, left Paris for Nantes. On July 5 he sailed in a French vessel, which he had joined from Nantes in a fishing-boat, designing to sail round Ireland, and to land upon the western coast of Scotland. Another ship, the Elizabeth, was ordered to accompany him as a convoy, and on board this vessel the prince had placed 400,000*l.* sterling, with arms for several thousand men. These two ships fell in with a British cruiser, a fierce action ensued, and the Elizabeth was so much damaged as to be obliged to put back into Brest. The prince pursued his course to Scotland, and landed, July 28, at Barradale, on the shore of the bay of Lochnamuagh, Argyleshire. He went to the house of Kinlochmoidart, where he was met by several Highland chieftains; and whence the clans were summoned to rise. About ten days afterwards the prince set up his standard at Glenfinnan. On Aug. 27 he advanced in hopes of meeting Sir John Cope, the commander-in-chief in Scotland; but on reaching Garvamore, he found that that commander had faced about, and taken the route by Ruthven to Inverness. It was now determined that the Jacobites should march to the south, and endeavour to get possession of Edinburgh before General Cope should arrive there. They reached Blair-Athol Aug. 30, and entered Perth Sept. 3, where the Pretender's declarations were read. At Perth great numbers flocked to his standard. Among the most considerable were the Duke of Perth, Lord Strathallan, and Lord George Murray. The reception which the prince met with in the Lowlands was not so cordial as he expected. He arrived, Sept. 15, within nine miles of Edinburgh, which capitulated two days afterwards. At noon, on the 17th, Charles, in a Highland dress, at-

tended by the Duke of Perth and Lord Elcho, came by Duddingston into the King's Park, and entered Holyrood Palace. There was a great crowd assembled to receive him. 'The figure and presence of Charles,' observes Mr. Home, who witnessed his entrance to Holyrood, 'were not ill-suited to his lofty pretensions. He was in the prime of youth, tall and handsome, and of a fair complexion.'

In the meantime Sir John Cope had marched from Dunbar to Haddington, and thence to Prestonpans and Seaton. The Highlanders accordingly advanced to Tranent Sept. 21, and continued their march until they saw the king's soldiers encamped near Preston. A morass, which was pronounced to be impassable, divided the armies. The afternoon was spent in movements. At night both armies lay down to repose, the Highlanders with the resolution of attacking the king's troops early in the morning. During the night a country gentleman, who knew the ground well, offered to show the Prince a part of the morass whence the rebels might attack their enemies without observation. Accordingly before break of day the morass was passed, and the two armies were separated only by a corn-field. The Highlanders followed up the advantage which they had gained with wonderful success. A panic seized the king's troops. The Highlanders threw down their muskets, drew their swords, and pursued the enemy. All the king's infantry was killed or taken prisoners, except about 170. This was called the Battle of Prestonpans.

Charles and his council did not deem it prudent to appear in England with so small an army, and resolved to wait some time longer at Edinburgh. The castle of Edinburgh remained still in the possession of the king's troops, commanded by General Guest, between whom and the Highlanders a contest arose, during which several houses were set on fire, and several persons on both sides killed. Lord Kilmarnock and Arthur Elphinstone, afterwards Lord Balmerino, at this time joined the Prince, and Lord Ogilvie, eldest son of the Earl of Airly, arrived in Edinburgh with a regiment of 600 men. Charles marched out of Edinburgh Oct. 31, in opposition to the advice of his council, leaving Lord Strathallan to command in Scotland. At Dalkeith House he was joined by the clan Macpherson and some other Highlanders, amounting in all to about 1000 men: this made his whole force about 6500. With one division of his army the Prince marched to Kelso, and reached Brampton in Cumberland Nov. 8. On the next day the other division of the army arrived, and proceeded to invest Carlisle, which surrendered to the Duke of Perth Nov. 15. It was now determined to march directly to London. Leaving a garrison in Carlisle, the Jacobites marched forward in two divisions: the first, commanded by Lord George Murray, arrived at Penrith Nov. 21; the second, or main body, headed by Charles, chiefly composed of Highland regiments, followed, and advanced from Penrith, by Shap, Kendal, Lancaster, and Garstang, to Preston. On the 29th they reached Manchester, by way of Wigan, and were joined by 200 or 300 of the common people. Both divisions arrived by different routes at Derby, Dec. 4. During the march from Carlisle to Derby, the Prince learned that John Drummond, the Duke of Perth's brother, had arrived at Montrose with his own regiment, the Royal Scots, Fitzjames's regiment of horse, and the picquets of six Irish regiments in the service of France.

The king's forces, under the Duke of Cumberland, lay at Lichfield, Coventry, and Stafford. It seemed at first to be the intention of the rebels to avoid the Duke, and to advance to London; but after halting a day or two in Derby, they retreated, with the design of meeting Lord Drummond's army, which was coming from the north. The Duke of Cumberland now began the pursuit of the rebels, who were only two days' march before him. Lord George Murray, who commanded the rear-guard, defeated the Duke's dragoons at Clifton near Penrith. On Dec. 20 the Scottish army left Carlisle, and crossed the Esk into Scotland. At Glasgow they remained seven or eight days, and the troops then began their march to Stirling, in two divisions. The town of Stirling soon surrendered, and Charles's army, now amounting to 9000 men, attacked the castle of Stirling. On Jan. 16, 1746, General Hawley left Edinburgh, which he had entered during Charles's absence, and marched to Falkirk, where he was totally defeated, lost his cannon and ammunition, and retreated to Linlithgow, while Falkirk was taken possession of by the Highlanders. The Duke of Cumberland arrived at Edinburgh, whither General Hawley had retired, Jan. 30, and on the following day he marched against the enemy. Lord George Murray was at Falkirk, and Prince Charles was at Stirling. The rebels at first resolved to make a stand, and to give the Duke battle; but on the following morning they raised the siege of Stirling Castle and retreated. During the months of February and March a desultory war was carried on, until, at the end of March, news was brought that the Duke of Cumberland was marching towards Inverness, which was occupied by the Prince. Charles retreated to Nairn April 14, where he again made a stand. That night the Highlanders slept amid the furze and trees of Culloden Wood, about three miles from Nairn. The Prince's army was now much dispersed, and many of his best officers were absent. Nevertheless the Prince and Lord George Murray, in opposition to the Duke of Perth and Lord John Drummond, who recommended waiting until the next day for reinforcements, resolved upon a night attack upon the Duke of Cumberland at Nairn. The Duke however had gained intelligence of the attempt, and by five in the morning his army was on its march. The Highlanders, whose march had been impeded by the darkness of the night, were weary and dispirited, and retraced their steps to Culloden, where many of them lay down to sleep. About eight o'clock the duke's forces were seen marching towards them; and about twelve they were within two miles and a half of the rebels. About one o'clock a heavy cannonade was begun by the king's troops, and continued till two. The High-

land regiments suffered severely. The Highlanders became impatient to attack, and while Locheil was speaking to Lord George Murray, the Mackintosh regiment broke out from the line, and drove back the king's troops, sword in hand, but they were mostly brought to the ground by a terrible fire. At this crisis the Duke of Cumberland advanced with the infantry, and the Highlanders fled; some retired to Badenoch, and others to the hills. The dragoons pursued and slaughtered the fugitives. When Charles saw, for the first time, his Highlanders repulsed and flying, he advanced to rally them; but Sir Thomas Sheridan dissuaded him from the fruitless attempt.

The rebels are said to have lost about 1000 men. The Prince, after dismissing the troops which followed him, went to Gorthleek, where Lord Lovat was, whence he sent a farewell message to the remnant of his army, thanking them for their services, but desiring them to attend to their own preservation. He next proceeded to Invergarie, near Fort Augustus, where he took leave of all his followers except Sullivan, O'Neil, and Burke, a servant who knew the country. Charles had now resolved to escape to France. Hunted from place to place, his adventures are scarcely equalled by the fictions of any romance. In this perilous condition Charles remained until the end of June, when he was delivered from his danger by Flora Macdonald, the daughter of Macdonald of Melton, in the isle of South Uist, who, at the risk of her own life, conveyed him to Skye as her maid, dressed in female attire. Here he was exposed to fresh perils, living in a cave for five weeks and three days; but at length, after many narrow escapes, he was able to cross Locharkaig, and reach the fir-wood near Achnacarry. Thence he was enabled, at considerable risk, to reach Barradale, Sept. 19, and sailed for France on the 20th, arriving at Morlaix in Brittany on the 29th. No organised scheme for establishing Charles Edward upon the throne of England was ever afterwards formed.

Charles was received in France with professions of affection from Louis XV.; and he remained in France until his departure became necessary to ensure peace with England. He then repaired to Rome. Charles Edward married a princess of the house of Stolberg in Germany. When the courts of Europe no longer gave him the title of Prince of Wales, he took that of Count of Albany, and sank into a habit of life strangely contrasted with his former activity. He died Jan. 31, 1788. He had no issue by his wife; but he left a natural daughter, whom he created Duchess of Albany, and to whom he bequeathed a considerable property. His wife survived him, and married Alfieri, the dramatic poet. His brother, Henry Benedict, who was created by the old Pretender Duke of York, and afterwards made Cardinal York, was the last representative of the royal house of Stuart. Henry Benedict died at Rome in 1807.

STUART, ARABELLA, or ARBELLA, was born, according to various statements, in 1575, 1576, or 1577. She was the only child of Charles Stuart, duke of Lennox, younger brother of Henry, lord Darnley, the father of James I. James and she therefore were full cousins. The Lady Arabella also stood in the same degree of relationship to Elizabeth that James himself did through his mother; both were great-grandchildren of Henry VIII.'s eldest sister Margaret; James through his mother Queen Mary, and her father James V. of Scotland, son of that princess by her first husband; Arabella, by her father, Charles Stuart, and his mother, Margaret Douglas, the daughter of the English princess by her second husband, Archibald Douglas, earl of Angus. She was born in England, and during the reign of Elizabeth that circumstance was openly stated by Parsons, the Jesuit (in his 'Conference about the next Succession to the Crown,' published under the name of Dolman, in 1594), as giving her claim to the throne an advantage over that of the Scottish king. At all events she was undoubtedly, before the birth of his son Henry, in Feb., 1594, the next in order of succession to James; and, if he had died without issue, she would have been Elizabeth's heir, upon the same principle that he was so accounted.

She first became an object of general public attention by the manner in which her name was brought forward in 1603, after the accession of James, in the affair of the alleged plot called 'the Main,' for which Sir Walter Raleigh was tried. One of the charges against Raleigh was, that he designed to raise the Lady Arabella to the throne, under the protection of Spain. There is no probability however that any such design ever was entertained. Her situation however was a difficult and dangerous one. James's wish probably was, that she should remain unmarried; but in Feb., 1609, a discovery was made of a love affair in which she was engaged with Mr. William Seymour, second son of Lord Beauchamp, the eldest son of the Earl of Hertford; and, although both parties were called before the council, and sharply reprimanded, they managed to get secretly married very soon after. The marriage was discovered in 1610; and Seymour and the lady placed in separate confinement. The lady however contrived to escape from Highgate, where, on pretence of illness, she had remained in custody; and Seymour escaped from the Tower. Disguised in male apparel, the lady, on June 3, 1611, at six o'clock in the morning, reached Blackwall, where, going into a boat that was in readiness, she was rowed down the river, and next morning was taken on board a French vessel that waited for her and her husband at Leigh. But as Seymour did not make his appearance so soon as had been agreed upon, the vessel set sail without him, and he was obliged to make a bargain with a coaster from Newcastle to take him across to Flanders, which he reached in safety. His wife was not so fortunate; a small ship of war was dispatched from the Downs to intercept her, and she was captured in Calais Roads. She and Seymour never again met. She was thrown into the Tower, where she died insane, Sept. 27, 1615.

STUART, JAMES, frequently distinguished by the name of *Athenian Stuart*, was born in

London, in 1713, of humble parents. The talent he showed in drawing recommended him to Goupy, who kept a shop in the Strand, and who employed him to design and paint ladies' fans. He continued with Goupy till about 1742, when he set out for Italy, for the purpose of improving himself. Little more is known of him during his residence in Italy than that, after staying at Rome nearly seven years, he embraced the offer made to him by his friend Revett, of joining him in an excursion to Greece. Having previously issued a prospectus of their undertaking, and raised funds for their tour, by subscriptions received from England, the travellers quitted Rome in March, 1750. They passed some time at Venice, and in March, 1751, reached Athens, where they remained till about the end of 1753. They returned to England in 1755, but it was not until 1762 that the first volume of the 'Antiquities' was published. Stuart appears to have had by far the greater share in the labour, and the literary part is ascribed entirely to him. He did not however prosecute the continuation of his work very diligently, for the second volume was not entirely completed, and the third only in progress, at the time of his death. Neither was he very eager to avail himself of the opportunities afforded him as a practising architect. Lord Anson bestowed on him the appointment of surveyor of Greenwich Hospital, so that he was now in easy circumstances, and willingly relaxed from continued exertion. His principal work is the chapel of Greenwich Hospital, as rebuilt by him, after being destroyed by fire. For Lord Anson he built a mansion in St. James's Square, and also several ornamental structures, in imitation of antique models, in the grounds of that nobleman's seat at Shuckburgh. He died Feb. 2, 1788. The second volume of the 'Antiquities' was edited by Newton, 1790; and the third by Reveley, in 1794.

STUART, GILBERT, LL.D., was born at Edinburgh, according to the common account, in 1746; but in 1742, according to Kerr's 'Memoirs of Smellie.' He was educated for the law; but a passion for general literature early took possession of him. He first made himself known by his 'Historical Disquisition concerning the Antiquity of the British Constitution,' 1767, for which the university of Edinburgh bestowed upon him the degree of LL.D. In the following year appeared his 'View of Society in Europe, in its Progress from Rudeness to Refinement; or, Inquiries concerning the History of Laws, Government, and Manners.' He soon afterwards failed to obtain the vacant professorship of Public Law in the university, and in consequence left Edinburgh for London. In London, where he resided from 1768 to 1773, he is understood to have been chiefly employed in writing for the 'Monthly Review.'

In 1773 he returned to Edinburgh; and then he and Mr. William Smellie, the printer (a man of talent and considerable literary acquirement), set up together a new monthly periodical, entitled 'The Edinburgh Magazine and Review.' The first number of this publication appeared in Oct., 1773, the 47th and last in Aug., 1776. The general spirit of the articles, especially of those written by Stuart, was of such severity, instigated too, as was conceived, in many cases by his personal resentments, that a public feeling was at last aroused against the work, which compelled its conductors to give it up. A list of Stuart's reviews and other communications is given in Kerr's 'Life of Smellie,' i., 403-405. Besides contributing to other periodicals he produced several additional works in his own name; his 'Observations concerning the Public Law and Constitutional History of Scotland,' 8vo., Edinb., 1779 (an attack upon the introductory book of Dr. Robertson's 'History'); his 'History of the Establishment of the Reformation of Religion in Scotland,' 4to., Lond., 1780; and his 'History of Scotland from the Establishment of the Reformation to the Death of Queen Mary,' 2 vols. 8vo., Lond., 1782, another attack upon Robertson. Stuart returned once more to London in 1782; but jaundice and dropsy were undermining his constitution. He returned to Scotland in 1786, and died in his father's house at Musselburgh, Aug. 13, in that year.

STUBBS, GEORGE, was born at Liverpool in 1724, and settled in London as a painter of animals. He excelled especially in the portraits of horses. He completed in 1766 his work 'On the Anatomy of the Horse,' in eighteen tables; and before his death three numbers of another work under the title of 'A Comparative Anatomical Exposition of the Structure of the Human Body with that of a Tiger and a common Fowl,' in thirty tables. Many of his productions have been engraved. His Spanish Pointer, engraved by Woollettt, is a fine specimen. He died in 1826.

STUCCO, an Italian word adopted in most other languages, and applied as a general term to plaster of any kind used as a coating for walls, and to give them a finished surface. *Stuccatura*, or stucco-work, is the term similarly employed for all interior ornamental work in imitation of carved stone, so executed, such as the cornices and mouldings of rooms, and the enrichments of ceilings. Stucco was very much employed by the ancients, and not merely for coating columns, &c., constructed of brick, but in many instances for covering stone, or even marble; for which last purpose it was applied so sparingly as to be no more than a very thin incrustation, for the purpose, it is now supposed, of being painted upon.

The stucco used for internal decorative purposes, such as those above mentioned, is a composition of very fine sand, pulverised marble, and gypsum, mixed with water till it is of a proper consistency. Within a short time after being first applied, it begins to set, or gradually harden, in which state it is moulded, and may at length be finished up with metal tools.

The stucco employed for external work is of a coarser kind, and variously prepared, being now manufactured wholesale as an article of commerce, ready for use; and of which the different sorts are generally distinguished by the name of *cements*. Adam's or Liardet's Cement is an oil-cement, of which the chief ingredients are fine whiting and calcined oyster-shells, well mixed and ground up in a mill with oil. Parker's or Roman Cement,

that now most in use, consists chiefly of a preparation of argillaceous limestone found on the coasts of Essex and Kent, and in the Isle of Sheppey. Of Bailey's Cement lime and sharp sand are the principal ingredients. Mastic Cement, or Hamelin's Cement, is composed of peroxide of lead and oil. Keene's Cement is one of very recent invention, and of very superior quality, taking a surface and polish almost equal to that of the finest marble. It is in fact a species of scagliola; consequently it is employed, like that, only for interior decoration. Almost every year produces some new kind of stucco.

If perfectly well executed, stucco will be nearly equal in appearance to stone, and even superior to that of stone of inferior quality. There are some who protest against the use of stucco externally, as a spurious and meretricious mode of building with sham material; but it is certain that most of Palladio's edifices, and of what are spoken of as the 'marble palaces' of Venice and Rome, are merely faced with stucco.

STUERBOUT, DIERICK, commonly called DIRK VAN HAARLEM, was born at Haarlem, in the early part of the 15th century. He is perhaps the oldest of the Dutch painters, and one of the best of the early masters. The two large works by him in the Royal collection at the Hague, illustrative of a story in the old chronicles of Louvain connected with the ordeal by fire, are wonderful works for their time. They were painted for the town-hall of Louvain in 1468, and were preserved there until 1827. The execution is in the style of the Van Eyck school, and is extremely elaborate, especially in the second piece, which is superior to the first. Other pictures by the same artist are spoken of, but none are believed to be extant. M. Nieuwenhuys and others give 1410 and 1470 as the respective dates of Stuerbout's birth and death, but how the information is acquired is not stated.

STUHLWEISSENBURG. [Hungary.]

STUKELEY, the REV. WILLIAM, M.D., was born at Holbeach in Lincolnshire, Nov. 7, 1687. From the grammar-school of his native town he went to Bennet College, Cambridge, in 1703. At this time natural science, as connected with the medical profession, seems to have been his favourite pursuit. Having taken his degree of M.B. in 1709, Stukeley repaired to London, where he attended St. Thomas's Hospital as a pupil of Dr. Mead; and then he settled as a medical practitioner at Boston, in his native county. In 1717 he removed to London; in 1719 he took his degree of M.D.; in 1720 he was admitted a Fellow of the College of Physicians. He left the metropolis in 1726, and fixed himself at Grantham. Here he soon acquired great reputation. His health however had been for some years giving way, and in 1729 he relinquished medicine and took orders. The same year he was presented to the living of All Saints in Stamford; and in 1739 to the living of Somerby, near Grantham. In 1747 he was presented to the rectory of St. George the Martyr, in Queen Square, London, and this brought him again to the metropolis. He died in the rectory-house, March 3, 1765.

The taste for antiquarian research showed itself in Stukeley at an early age, and it is as a writer on British antiquities that he is now remembered. His only medical publication is 'A Dissertation on the Spleen,' which appeared in 1723. His principal antiquarian work is his 'Itinerarium Curiosum, or an Account of the Antiquities and remarkable Curiosities in Nature or Art observed in Travels through Great Britain;' illustrated with copper-plates, fol., 1724. A second volume, or 'Centuria,' as it is designated, was added to this work from the papers and drawings which he left at his death ready for the press; and was given to the world, along with a reprint of the former volume, in 1776. In 1759 appeared, in a quarto volume, one of his most remarkable works, entitled 'Some Account of the Medallic History of Marcus Aurelius Valerius Carausius, Emperor of Britain.' 'I have used his materials,' says Gibbon, in one of his notes referring to this work, 'and rejected most of his fanciful conjectures.' This precaution is indeed necessary, notwithstanding Stukeley's real learning and research. His only theological work, we believe, was a collection of Sermons, published in 1760, under the title of 'Palæographia Sacra,' principally occupied with the natural history and botany of the ancient world.

STURGEON. [Sturionidæ.]

STURIO'NIDÆ, a family of fishes belonging to the section *Chondropterygii*, the species of which are distinguished from others of the section by the gills being free, as in ordinary fishes, thus differing from the second great division of the fishes having a cartilaginous skeleton, such as the Sharks and Rays, in which the gills are fixed, and have their outer margin attached to the skin. The *Sturionidæ*, or Sturgeon Tribe, have more over but one opening to the gills, and this is protected by an operculum.

Four genera are contained in this family, viz. *Accipenser*, *Spatularia*, *Chimæra*, and *Callorhynchus*. To the first of these genera belongs the Common Sturgeon (*Accipenser Sturio*, Linn.), which is not unfrequently met with in the mouths of English rivers. It is of an elongated form, and has the body protected by numerous indurated plates, which are arranged in longitudinal series; the head is entirely covered by bony plates; the muzzle is elongated, and more or less pointed; and the mouth, which is placed on the under side of the head, is tubular, and destitute of teeth: on the back is a single dorsal fin, which is placed on the hinder third of the fish; the tail is forked, and the upper lobe is the largest, as in the Sharks.

'In the northern part of Europe,' observes Mr. Yarrell, 'this fish is much more numerous than with us, and extensive fisheries are established for its destruction. Caviar is made of the roe of the female; isinglass is obtained from the dense membrane forming the air-bladder; and the flesh, besides being preserved by salting and pickling, is in request for the table while fresh, being generally stewed with rich gravy, and the flavour considered to be like that of veal. The flesh, like that of most of the cartilaginous fishes, is

more firm and compact than is usual among those of the osseous families.'

Two species of sturgeon have long been distinguished by the fishermen of the Solway Firth, the one with a blunt nose, and the other with a sharp nose: the latter is the most common of the two; the former has recently been described by Dr. Parnell, in the 'Transactions' of the Royal Society of Edinburgh (vol. xiv., pl. 4), and is introduced by Mr. Yarrell, in the Supplement to his 'History of British Fishes.'

Several very distinct species frequent the rivers of Russia. Three species are found in the rivers which flow into the Black Sea, and North America also possesses species which are peculiar.

Of the genus *Spatularia*, one species is known (*Squalus spatula*, Manduit), an inhabitant of the Mississippi. The genus *Chimæra* is represented by the *C. monstrosa*, Linn., a native of the northern and European seas. Of the genus *Callorhynchus*, three species are known, from the southern seas,' Van Diemen's Land, &c.

STURM, JOHANN, was born Oct. 1, 1507, at Schleiden in the Eifel, between Trier (Trèves) and Cologne. In 1524 he went to Louvain, where he devoted himself to ancient literature, but after a few years' study he entered into partnership with Rutger Rescius, an eminent Greek scholar, who was forming a printing establishment at Louvain. The only works that are known to have issued from their press are an edition of Homer, and one of Xenophon's 'Memorabilia Socratis,' which appeared in 1529, 4to. In this year Sturm went to Paris, where he set up a school. Sturm had adopted the Lutheran creed before he left Germany, but took care not to avow it in public. As his Protestantism exposed him to some inconvenience at Paris, he accepted the place of rector in the gymnasium of Strassburg, 1538. The school under his direction became one of the most flourishing in Germany, and in 1566 it was raised to the rank of a university, under the management of Sturm. While he was devoting himself to his duties as a teacher and rector, he was no less active in promoting the interests of Protestantism. He was sent on various missions concerning religious matters, and was extremely liberal and kind towards all who suffered for their religious opinions. But he showed nothing of a sectarian spirit, and some of his friends, who were staunch Lutherans, began to suspect him of leaning towards the doctrines of Calvin. They openly attacked him in their sermons, the consequence of which was that he gave up attending them. Various charges were at last brought against him, among which it was alleged that he had not been at church or partaken of the Lord's Supper for twenty years. His enemies at length succeeded, in 1583, in persuading the magistrate of Strassburg, on the pretext of his old age, to deprive him of his office, which was given to Melchior Junius, one of his former pupils. Notwithstanding the honourable appearance of his dismissal, and although he was left in the enjoyment of his former salary, he keenly felt the wrong which was done to him. His strength rapidly declined, and he died on the 3rd of March, 1589.

Sturm was one of the most amiable, benevolent, and learned men of the age. As a teacher he was very successful; and on account of his rhetorical knowledge, and his elegant Latin style, he was called the German Cicero. All his works, which are numerous, are written in Latin. Among them is an edition of Cicero, Strassburg, 1540, 9 vols. 8vo.; and four books on Rhetoric, Strassburg, 1576. Roger Ascham, the preceptor of Queen Elizabeth, was a friend of Sturm, and corresponded with him. Ascham in his 'Schoolmaster,' recommends for early instruction in Latin, 'The Epistles of Cicero, gathered together and chosen out by Sturmius, for the capacity of children.' A short notice of this book is given in an edition of Cicero's 'Cato Major, Lælius, et Epistolæ Selectæ,' 1850, London, by G. Long.

STURM, JOHANN CHRISTOPH, a German mathematician and natural philosopher, was born at Hippelstein, in Bavaria, November 3, 1635. Having made considerable progress in the study of the sciences and the ancient languages at a school in Nürnberg, young Sturm was sent to the university of Jena, where he took his degrees; and in 1660 he went to study at Leyden. He remained there only one year, and then he returned to Jena, where he qualified himself for the church. He was appointed to the ministry for one of the parishes in the territory of Oettingen, where he continued to perform the duty till 1669, when, through the interest of his friends, he was appointed professor of mathematics in the university of Altdorf, in Franconia. This post he held during thirty-four years, and it is said that he was the first who introduced, in the gymnasia and the common schools of Germany, the practice of giving instructions in the elements of useful science to the children of the working classes. He died December 26, 1703.

The principal works of Sturm are—'Collegium Experimentale sive Curiosum, in quo primaria hujus seculi Inventa et Experimenta Physico-Mathematica An. 1672,' &c., Nürnberg, 1676, 2 vols. 4to.; 'Mathesis Juvenilis,' 2 vols. 8vo., of which the second contains a tract entitled 'Scientia Cosmica, sive Astronomica, Spherica, et Theorica Tabulis comprehensa,' Nürnberg, 1684; and 'Philosophia Eclectica,' Nürnberg, 1685, being a collection of the principal dissertations before published on the different systems of philosophy.

STURM, CHRISTOPH CHRISTIAN, was born Jan. 25, 1750, at Augsburg. He studied theology at Jena and Halle, and was subsequently appointed preacher at Magdeburg. In 1778 he became pastor at the church of St. Peter, at Hamburg. He died Aug. 26, 1786.

Sturm wrote many religious works, which are more of a practical than of a scientific character. Among the most important is his 'Betrachtungen über die Werke Gottes im Reiche der Natur und der Vorsehung auf alle Tage des Jahres,' 1785. This work has been translated into English by Clarke, under the title of 'Reflections on the Works of God,' &c. Sturm also published a considerable number of sermons, and among them a

collection of sermons for children. He also occupies a considerable rank among the writers of sacred poetry.

STURMINSTER. [DORSETSHIRE.]

STURNIDÆ, Mr. Vigors's name for the Starling Family, belonging to his order *Insessores*.

Linnæus placed his genus *Sturnus*, consisting of only five species, among which the Water-Ouzel appears as *Sturnus Cinclus*, between *Alauda* and *Turdus*, in his order *Passeres*. Cuvier arranges the Starlings between the *Cassiques* (*Cassicus*) and the Crows (*Corvus*).

Mr. Vigors, who assigns to the *Sturnidæ* a place between the *Fringillidæ* and the *Corvidæ*, in his *Conirostres*, observes that this family embraces a considerable number of groups, approaching each other in their gregarious and migratory habits. They are, he remarks, found in every part of the globe united in large flocks, carrying destruction among the cultivated fields, and following herds of cattle for the sake of the insects or grains which they may pick up from their bodies or in their neighbourhood. ('Linn. Trans.,' vol. xiv.)

Mr. Swainson, the Prince of Musignano, and Mr. G. R. Gray have each proposed their respective arrangements of the subfamilies or minor groups (every group including many genera), into which this family, of which we may regard the Common Starling (*Sturnus vulgaris*) as the type, may be divided. For a full exposition of their views, we must refer to Swainson's 'Synopsis,' to the Prince of Musignano's 'Birds of Europe and North America,' and to Mr. G. R. Gray's 'Genera of Birds.'

The Common Starling is too well known to need any description. (Gould's 'Birds of Europe;' Yarrell's 'British Birds,' &c.) The beautiful *Sturnidæ* of North America are admirably figured and described by Audubon. See also Wilson's 'American Ornithology.' The only British examples are the Starling and the Rose-coloured Pastor or Ouzel (*Pastor roseus*, Temm.).

STUTTGART, the capital of the kingdom of Würtemberg, is situated 2 miles from the left bank of the Neckar, in 48° 45′ N. lat., 9° 12′ E. long., and has 40,000 inhabitants. It is built in the valley of the Nesenbach, surrounded on three sides by hills covered with vineyards and gardens. The city consists of the old town, the suburb of Essling, the upper suburb, and the new streets and suburbs built under the late King Frederick. These however have been all thrown into one, every mark of separation between them being removed. The old part of the city is ill-built, the streets being narrow and irregular, and the houses for the most part of wood. The more modern parts have straight streets, intersecting each other at right angles, and contain many handsome buildings. The best street is the Königs Strasse, which crosses the whole city, passing one end of the square in which the old and new palace and the theatre are situated. The new palace is a noble edifice, consisting of a centre and two wings; it has an extensive park, and in front of it is a spacious parade. The gardens and grounds of the palace are very fine, and extend to the new royal country-seat of Rosenstein, near Kannstadt. The palace contains a good collection of paintings and statues, and the windows command delightful views over the adjacent country. In the vicinity of the palace there are several public institutions. Among other buildings deserving notice are—the Gymnasium Illustre, the former military academy, which resembles a palace, the old palace, now occupied by the officers of the government, the opera-house, the foreign office, the royal mews, the parliament house, the museum of natural history, the new hospital, and the three barracks, which are among the most considerable buildings in the city. Behind the old palace is the Stiftskirche, which contains the monuments of the dukes of Würtemberg from the 13th to the 17th century. In front of the Stiftskirche is a colossal bronze statue of Schiller, designed by Thorwaldsen. In the cloisters of the hospital church there are many old monuments. The public royal library contains 200,000 volumes. The king's private library of 30,000 volumes contains valuable old works and manuscripts, and a great variety of modern publications. Stuttgart has a gymnasium, an academy and school of arts, a botanic garden, a veterinary school, a savings'-bank, and numerous useful and charitable institutions. The royal villa of Rosenstein about 2 miles down the valley, at the bottom of the palace gardens, is a great attraction to visitors; it is built on a projection between two valleys; commands fine views of Stuttgart, the valley of the Neckar, and the town of Kannstadt on the right of that river; and is decorated with fine sculptures. Stuttgart has manufactories of linen and woollen cloths, silk, cotton, gloves, carpets, shawls, &c., and is noted for its beautiful works in gold, silver, and bronze; mathematical, philosophical, optical, and musical instruments; cabinet furniture, lackered ware, and carriages. The bark-trade is extremely flourishing. The navigation of the Neckar gives Stuttgart water-communication with the Rhine. Lines of railway, partially in operation and rapidly approaching completion, connect it with the Bavarian and Rhine railroads.

STYLE (Botany). [STIGMA.]

STYLE, manner of writing, from the Latin *stylus*. The Romans gave that name to an iron bodkin having a sharp point, with which they were accustomed to write by scratching on their wax-covered tablets or note-books; and from the instrument of writing, the term was transferred to the writing itself, and that too considered in reference not to the form of the characters, but to the mode of expression. Among the Romans however the term, in this figurative application of it, retained always considerably more of its antecedent meaning than it does with us. We say not only style of writing and style of speaking, but style of painting, style of architecture, style of dancing, style of dress, style of anything in which form or manner is conceived to be, in however slight a degree, expressive of taste or sentiment—if even this much of distinction still remains between what is called style and mere manner in the widest or loosest sense.

Style, in writing or speaking, may of course

mean a bad style as well as a good style. Yet when the word stands alone, we always understand it in the latter sense—just as when we speak of expression in painting or in music we mean just or forcible expression.

STYLE, OLD AND NEW. By the Old Style is meant the mode of reckoning time anterior to the Gregorian reformation of the calendar; and by the New Style that adopted since. The adoption of the reformation at different times by different countries renders it necessary to remember the difference of their reckonings, as follows.

The reformation took place in 1582; from thence to the end of February, 1700, new style is ten days in advance of old style: thus January 1 (O. S.) is January 11 (N. S.), and so on.

From and after March 1, 1700, to the end of February, 1800, new style is eleven days in advance of old style: thus January 1 (O. S.) is January 12 (N.S.).

The new style was adopted in England by 24 Geo. II. (1751), which enacted, 1, That the year 1752 should begin on the 1st of January instead of the 25th of March, which was then the *legal* commencement. 2, That the third day of September 1752, should be called the 14th, or that the days from the 3rd to the 13th inclusive should have no nominal existence. Accordingly, the year 1751 had no January, February, nor March up to the 24th inclusive; and September wanted eleven complete days.

According to Sir Harris Nicolas, the new style was adopted as follows: by Denmark, France, Holland, and most of the Low Countries (some towns excepted), most of Italy, Lorraine, Portugal, and Spain, in 1582; by German and Swiss Catholics in 1584; by Poland in 1586; by Hungary in 1587; by German and Swiss Protestants, and the remaining parts of the Low Countries, &c., in 1700; by Tuscany in 1749 or 1751; and by Sweden in 1753. It is not yet adopted in Russia.

It was at one time sometimes the mode to express the date in both styles. We have an old letter written from France to Holland in 1619, as we should now call it, the date of which is Février $\frac{15}{25}$, 161$\frac{8}{9}$.

STYLES OF ARCHITECTURE. The principal styles of architecture are described under the heads of CIVIL ARCHITECTURE (which includes the *Greek Architecture* and *Roman Architecture*), EGYPTIAN ARCHITECTURE, GOTHIC ARCHITECTURE, HINDUSTAN (vol. vii. p. 230), ITALIAN ARCHITECTURE, LOMBARDIC ARCHITECTURE, MOORISH ARCHITECTURE, NORMAN ARCHITECTURE, and RENAISSANCE.

STYLIDIA'CEÆ, a natural order of plants belonging to the epigynous group of Monopetalous Exogens. There are only two genera of this order known besides *Stylidium*. They are chiefly found in Australia, but species have been discovered in the Himalayas, Ceylon, and the South Sea Islands. Their properties are unknown.

STYLI'DIUM (a diminution of *stylus*, 'a column'), the name of a genus of plants, the type of the natural order *Stylidiaceæ*. This is chiefly an Australian genus of plants, and is remarkable for its gynandrous structure, and for the irritability of the column formed by the union of filaments and style. Exposure to heat will erect the column, and its withdrawal will cause it to return to its natural position. After returning to this state, it requires ten or fifteen minutes' rest before it will again exhibit irritability.

STY'LIFER, or STILIFER, Mr. Broderip's name for a marine shelled mollusk, constituting the type of a new family of *Pectinibranchiata*, characterised by him from a shell with the soft parts attached, among other specimens brought home by Mr. Hugh Cuming.

Generic Character.—Shell hyaline, turbinated, the apex of the spire mucronate. The aperture subovate, acuminated above. The external lip acute and sinuated.

Example.—*Stylifer Astericola*, Brod.

Mr. Broderip states that the arrival of this species with the soft parts had afforded data for a generic character, indicating a distinct family among the *Pectinibranchiata*, the form of whose mantle differs from that of any other genus of the order.

Mr. Cuming found this elegant parasitic sea-snail burrowed in different parts of the rays of the disc of *Asterias solaris*. It was almost hidden from sight, so deeply does the animal penetrate into the substance of the star-fish, in which it makes a comfortable cyst for itself, and wherein it most probably turns by the aid of its rudimentary foot. All the specimens infested with these testaceous mollusks appeared to be in the best health, though there is reason to believe that they feed upon the juices of the star-fish. Mr. Broderip observes that Stylifer (with that instinct of self-preservation which is imparted to all parasites whose existence depends upon that of their nidus) appears, like the larvæ of the ichneumon tribes among insects, to avoid the vital parts; for in no instance did Mr. Cuming find it imbedded anywhere save in the rays, though some of the individuals had penetrated at their base, and very near the disc. When extracted, the older shells have the appearance of a milky-clouded glass bubble: the younger shells Mr. Broderip found of an unclouded transparency.

STYLOBATE. In its general meaning this term signifies any sort of basement upon which columns are placed to raise them above the level of the ground or floor; but in its technical meaning it is applied only to a continuous unbroken pedestal, upon which an entire range of columns stand—in contradistinction to *Pedestal*, which is the basement of a single column.

STYPTICS, agents which check the flow, generally of blood, from a relaxed or ruptured vessel. They are a kind of astringent, and the principle of their mode of action has been already detailed. [ASTRINGENTS.] The best chemical styptics are saturated solutions of alum, sulphate of zinc, and creasote.

STYRACEÆ, a small natural order of plants, placed by Lindley in his polycarpous group of Monopetalous Exogens.

The species are found in the temperate and tropical parts of North and South America, and also in Nepaul and China. This order is chiefly

remarkable, in an economical point of view, for furnishing the Storax and Benzoin of commerce, Some of the species are used for dyeing yellow, and a species of *Alstonia* is employed as a substitute for tea. The various species of *Halesia* are the Snow-Drop Trees of Carolina.

STYRAX, the name of a genus of plants forming the type of the natural order *Styraceæ*. The species are elegant trees and shrubs. They are principally natives of America and Asia; one is found in Europe, and one in Africa.

Styrax officinalis, officinal Storax, is a native of Syria, Italy, and most parts of the Levant. It is common all over Greece and the Peloponnesus. It was first cultivated in England by Gerarde, but is still a rare plant in this country. Asiatic Turkey supplies whatever is met with in commerce. It is procured by incisions in the bark, or perhaps from the punctures of insects. What flows from these openings is a liquid resinous substance, which concretes into small tears, about the size of peas; these, aggregated into masses, constitute the *Styrax albus*, which is of extreme rarity. Another form is that called *S. amygdaloides*, also of great rarity and very high price. It is sometimes termed *Calamita vera*. The commercial article is of various degrees of purity and excellence.

S. Benzoin, Benjamin Storax, or Gum-Benjamin Tree, is the plant which produces the Gum Benzoin or Benjamin of commerce, which, as well as Storax, is used in medicine. [BENZOIN.]

STYRIA, a Crownland of Austria, situated between 45° 54′ and 47° 50′ N. lat., and between 13° 30′ and 16° 25′ E. long., is bounded N. by the archduchy of Austria, W. by Illyria, S. by Illyria and Croatia, and E. by Hungary. The area is 8642 square miles, and the population in 1842 was 983,744. The northern and western part of the country is covered with high mountains, which are called the Styrian Alps. Properly speaking, they are branches of the Julian Alps, which extend to the east; one of these branches separates the valley of the Ens from that of the Mur, runs south-east, as far as the Wild Alps, to the west of Semmering, where it joins the Noric Alps, and then proceeding in a south-easterly direction gradually declines to the plain of Oedenburg. The other branch divides the valley of the Mur from that of the Drave, and forms the frontier between Styria and Carinthia. A third mountain-chain runs from Loibl to the Save, and forms on that side the boundary towards Carinthia. All these mountains afford good pasture and are covered in many places with fine forests. The highest summits are the Grössenberg, 8381 feet; the Eisenhut, 7676 feet; the Grimming, 7540 feet, the Stangalpe, 7140; the Hochschwab, 7154; and the Bachstein, 7008 feet, above the sea. The southern and eastern parts of the province contain few lofty mountains, but there are many of moderate elevation, and numerous gentle eminences, some of which are separated by extensive valleys. The country is divided into—Upper Styria, comprising the smaller north-western portion, which is entirely mountainous, and contains several glaciers; and Lower Styria, which is the south-eastern, and larger, lower, and level portion. The country has numerous rivers, all of which flow into the Danube. The principal rivers are—the Mur, which rises in a lake, traverses the centre of the country for about 180 miles, is joined by many smaller rivers, and enters Hungary below Luttenberg, and soon after enters the Drave: the Drave, which enters Styria, 58 miles E. of Villach, passes Marburg, and from a few miles above Warasdin runs along the Croatian and Hungarian frontiers: the Ens: the Raab: and the Save, which forms part of the southern boundary. The Mur, Drave, Ens, and Save are navigable by boats. There are many small lakes. The country abounds in cold, warm, and hot mineral-springs, the best known are those of Rohitsch, Neuhaus, and Sekau. Styria has numerous caverns, the most interesting of which is the Mirnitz cavern.

The air in the mountainous part is cold; in the valleys of Lower Styria the temperature is much milder, and the vine and maize flourish. A great part of Upper Styria consists of bare naked limestone rocks and sterile mountains, but Lower Styria has many very fertile tracts. The common domestic animals, with game, poultry, fish and bees abound. The breeding of cattle, which are small, is very general. Sheep are not numerous, and the horses are more fit for draught than for the saddle. The vegetable products are—wheat, rye, barley, and oats, in Upper Styria; in Lower Styria, they include likewise maize, millet, buckwheat, oleaginous seeds, some flax and hemp, hops, pulse, and vegetables of various kinds. Wine and fruit are among the chief productions. Timber, which is cut in the mountainous forests and conveyed by ingenious methods down the sides of the mountains to the nearest rivers, and by these carried to the low country, is a very important article of commerce. The principal kinds are oak and beech; but pine, fir, chestnut, walnut-tree, red yew, lime, white poplar, and willow are scattered over the whole country. The great wealth of Styria however consists in its mines, which are confined to the mountainous portion of the country. The most important minerals are—silver, copper, lead, iron (540,000 cwt. a year), alum, cobalt, sulphur, salt, marble, and coal.

The most important manufacture is iron. The iron-mines in the Erzberg, in the north of Styria, were well known to the Romans. This mountain does not contain the ore in veins or strata, but presents a solid mass of iron-ore, which has been worked without interruption for eleven centuries. There are a few manufactories of linen, cotton, woollens, and silk, but none of considerable importance. There is a very brisk trade between Upper and Lower Styria; the latter supplies the former with corn, wine, and tobacco, and receives in return iron, timber, and salt. The exports consist of the metals above-named, and of scythes (a million), sickles (200,000 in a year), steel and iron wares, including razors, and several millions of Jews'-harps. The imports consist of fine cloths, linens, cottons, silks, and jewellery, and colonial produce. The transit trade between Italy and Germany, from Vienna to Trieste, is very important. This trade is greatly facilitated by good

common roads, and by the Vienna-Trieste railway now open from Vienna to Laybach.

By the new constitution of the Austrian Empire this Crownland has a diet of 60 members chosen by qualified electors; its place of meeting is Grätz. The inhabitants, consisting of Germans and Wends in the proportion of about two to one, are nearly all Catholics. The establishments for education are—the University of Grätz, two theological schools, four gymnasia, and above 630 common schools. The hospitals, infirmaries, and other charitable institutions are very numerous.

Bruck, a manufacturing town of 2500 inhabitants, is situated 30 miles N.N.W. by railway from Grätz, at the junction of the Murtz with the Mur. Its position on a navigable river, and at the junction of several highways to the great road from Vienna to Italy, confers upon this town an important transit trade; besides which there is a great export of iron and iron implements manufactured in the furnaces and foundries of the town. *Judenburg*, higher up the valley of the Mur and on its right bank, has copper works, a great manufacture of scythes, a printing-office, a gymnasium, and about 2000 inhabitants exclusive of the military. *Leoben*, 9 miles W. from Bruck on the left bank of the Mur, has a population of 2500, who trade in bar-iron, charcoal, and salt. There are numerous iron-mines and iron-works here; jet and coal mines are worked in the neighbourhood. *Furstenfeld*, near the Hungarian frontier, has a custom-house, a large tobacco factory, and about 4000 inhabitants. *Marburg*, 30 miles N.N.E. by railway from Cilly, stands on the left bank of the Drave, and has a population of 4000, who trade in wine, corn, leather, rosoglio, and fruits. It is defended by a castle, and has a gymnasium and an arsenal. *Cilly*, which is said to occupy the site of *Claudia Celeia*, the capital of ancient Noricum, is situated on the Sän, about 70 miles by railway S. from Grätz, and has a gymnasium, a training-school, and 2000 inhabitants, who trade in corn and wine. Coal-mines are worked near Cilly. *Eisenerz*, a village of about 1600 inhabitants, remarkable for its great iron-works and manufacture of steel, stands at the foot of the famous Erzberg, which is literally a mount of iron-ore about 3000 feet high and 5 miles in circuit. The ore is now quarried right down from the top and sides of the mountain, though formerly mines were worked in the usual way; the ore when disengaged above is thrown down the old shafts, and then conveyed by the horizontal galleries of the old mines to the smelting-houses.

Grätz, the capital of Styria, is beautifully situated on the Mur, in 47° 4′ N. lat., 15° 26′ E. long., 90 miles S.S.W. from Vienna, and has 48,000 inhabitants. It consists of the Inner Town (which lies between the left bank of the Mur and the Schlossberg), and five suburbs. Its whole circuit is about seven miles. The Inner Town, which is built in the old style, with narrow irregular streets, is surrounded by high ramparts and a glacis, which is planted and forms an agreeable public walk; the defences of the town have been lately (1849-50) greatly strengthened. It is entered by 6 gates, and contains several good structures, among which the principal are the cathedral, a gothic structure built by the emperor Frederic IV. in the middle of the 15th century, all the altars in which are finely sculptured in marble; and near it, St. Catherine's chapel, the handsomest specimen of architecture in the town; the Imperial Burg, with its tower, opposite the cathedral, where the princes of Styria formerly resided; the Landhaus, where the nobility held their sittings; the town-hall; the university buildings, containing a library of upwards of 100,000 volumes, a collection of philosophical instruments, &c.; the Convict, the largest building in Grätz, formerly a Jesuit college now a public school; an arsenal; a theatre; several palaces of the Styrian nobility, &c. On the Schlossberg a mass of limestone 300 feet high, on the east side of the town, were not long ago the ruins of a strong castle destroyed by the French in 1809. A citadel, it is said, is now erected or in course of erection on this rock. The Murstadt, which is on the right bank of the river, and connected with the inner town by two bridges, is the finest and most extensive of the suburbs of Grätz, being embellished with several handsome buildings, squares, and gardens. The Jakomini suburb has handsome and regular streets, a riding-house, &c.; and the Leonhardt suburb, to the north of the Schlossberg, occupies a large space of ground at the foot of several hills, and is embellished with agreeable villas and gardens. Grätz contains altogether 22 churches and chapels, 5 monasteries, and 2 nunneries. An institution called the Joanneum, in which gratuitous lectures are delivered, was founded by the Archduke John in 1811; it contains very fine collections in mineralogy, botany, geology, experimental philosophy, and numismatics, besides a good library. There are also a botanical garden, with three conservatories; lunatic, orphan, and foundling asylums; an hospital, and a lying-in institution. Besides the university, which was founded in 1558, there are several public schools, and a well-supplied reading-room. Grätz has flourishing manufactures of steel and ironware, cottons, linen, woollen stuffs, silks, ribands, fans, paper, saltpetre, hats, pottery, &c.

STYX, a small stream in the north of Arcadia. In the ancient mythology the Styx was believed to be the principal river of the lower world, round which it flowed nine times. It was believed to be an arm of the river Oceanus, which flowed round our earth, and the river Cocytus was thought to be a branch of the Styx. When the gods of the ancients took a great oath, they always swore by the water of Styx, and awful punishment awaited him who swore falsely.

SUABIA, one of the ten circles into which Germany was divided previously to 1806, comprehended the south-western part of Germany, situated between France, Bavaria, Switzerland, Franconia, and the circles of the Rhine, and had an area of 18,000 square miles. Christianity was introduced among the Suevi, from whom Suabia took its name, at the beginning of the seventh century by the Irish monk Columba. In the year 1080 Henry IV. gave the duchy of Suabia

to Count Frederick of Hohenstauffen, under whose successors the Suabians were the richest and most civilised people of Germany. But when the house of Hohenstauffen became extinct in 1268, their vassals, cities, prelates, and counts made themselves independent. On the final dissolution of the ancient constitution of the German Empire, the duchy of Suabia was divided between Würtemberg, Bavaria, Baden, Hohenzollern, Lichtenstein, Austria, and Hesse-Darmstadt. The largest cities are Augsburg, Stuttgard, and Ulm.

The name of Suabia, which had disappeared from the map of Germany, was revived by the present ex-King of Bavaria, who restored to the circles of the kingdom the ancient historical names, and gave that of Suabia to the circle of the Upper Danube. [BAVARIA.] The chief towns of the circle are AUGSBURG and NEUBURG.

SUAKIN or SOUAKIN, a town or seaport in Nubia, on the west shore of the Red Sea, is in 19° 4′ N. lat., 37° 30′ E. long., at the extremity of a narrow inlet, about 12 miles in length and two in width. The entrance of the bay is only about sixty fathoms wide; it opens gradually to two miles, and has a depth of water varying from 15 to 19 fathoms, but it is difficult to enter except with a wind from the south. At the bottom of the bay there are several islands, on one of which the town is built. The town is separated from its suburb, called El Geyf, which stands on the mainland, by an arm of the sea about 500 yards wide. The harbour, which is E. of the town, is formed by a projecting part of the continent. The islands and all the surrounding country are sandy, and produce only a few shrubs or low acacias. The houses of the town have one or two stories, and are constructed of blocks of madrepores. The suburb El Geyf is rapidly increasing in size and population, and is larger than the town itself. Suakin is the most important trading-place on the west shore of the Red Sea. The population is said to be about 8000.

SUA'REZ, FRANCIS, was born at Granada, where his father practised as an advocate, Jan. 5, 1548. After receiving a good elementary education, he was sent to Salamanca to study law, in 1562. He was induced however, by the fervour of John Ramirez, to seek admission into the Society of Jesus, which he effected with difficulty. Before the probationary two years were completed, he was made to begin his philosophical studies. With this view he compiled for himself a system of metaphysics, which, published at a later period, elicited much applause. Having completed this task, he devoted the whole of his private hours to self-tuition in the science of casuistry. He taught philosophy for a short time at Segovia, and next theology, for several years, at Valladolid. In 1580 he was called to Rome, and lectured on theology there, in the college of the Society, with great applause for eight years; after which he was appointed professor of theology in the university of Alcalá, a situation which he held till 1596. On quitting Alcalá he lectured for a year at Salamanca; and was then appointed principal professor of divinity in the university of Coimbra by Philip II. On his way thither Suarez received the degree of doctor in theology from the university of Evora. He arrived at Coimbra in 1597, and spent there the remaining twenty years of his life. His lucid arrangement, extraordinary memory, and fervid eloquence, rendered his lectures eminently popular. Of all his works, that which excited most attention in this country was the controversial treatise called forth by the defence of the oath of fidelity published by James I., 'Defensio Fidei Catholicæ et Apostolicæ adversus Anglicanæ Sectæ Errores, cum Responsione ad Apologiam pro Juramento Fidelitatis et Præfationem Monitoriam Serenissimi Jacobi, Angliæ Regis.' It appeared at Coimbra in 1613. James I. replied, not by publishing a rejoinder, but by having the book condemned to be burned in London. By order of the parliament of Paris, it suffered the same fate in that capital in 1614. His systematic works were after his death collected and published under the auspices of the Society in 24 volumes. Suarez died at Lisbon, Sept. 25, 1615.

SUBBRACHIALES. [MALACOPTERYGII.]

SUBCONTRARY. In geometry, subcontrary sections are those which are made in the same manner with respect to an axis or plane of symmetry; though the term is mostly applied to the two circular sections of an oblique cone. In logic, subcontrary propositions are those which are of a contrary character, but not extensive enough to contradict each other of necessity, as 'Some As are Bs' and 'Some As are not Bs.'

SUB-DOMINANT, in Music, the fourth of the key, mode, or scale. Thus, in the key of C, F is the Sub-Dominant.

SUBERIC ACID, an artificial substance produced by treating rasped cork with diluted nitric acid. It is a white powder, with feeble acid qualities; it is very soluble in boiling water, and the greater part of it is deposited from the solution on cooling in the form of a white powder; it fuses at about 300°; and sublimes in acicular crystals. It consists of C^8 H^7 O^4.

The suberates are not an important class of salts. Suberate of ammonia is soluble in water; the suberates of potash and soda are deliquescent, and fusible without decomposition: those of lime, barytes, strontia, magnesia, alumina, and manganese are more or less soluble: protosuberate of iron is a white precipitate; the persuberate is a brown one: the suberates of tin, zinc, mercury, and silver are white insoluble substances: that of cobalt is red, of copper blue-green, and uranium yellow.

SUBERIN is a peculiar substance obtained from common cork. It is very inflammable; by distillation it yields water, a colourless oil, and afterwards a yellowish one, all of which are acid; then ammonia and a fatty crystallised substance are produced, and various gases are disengaged, while charcoal equal to one-fourth of the suberin remains in the retort.

SUBJECT, SUBJECTIVE.—These words, with their correlatives Object and Objective, are now again restored to English philosophical language, through the medium of the German writers. Subject is used to express the mind, soul, or personality of the thinker—the Ego or I. Object expresses anything or everything external to the

mind; everything or anything distinct from it—the non-Ego or not I. The universe itself, when considered as a unique existence, is an object to the thinker; and the very subject itself (the mind) can become an object, by being psychologically considered.

Besides its primary signification, object became metaphorically *motive, end, final cause,* &c., by a common change in all language, of the metaphor into a real signification. Subject also became synonymous with object, and probably the logical terms 'subject of predication' facilitated this confusion. Be this as it may, the extreme want of precision with which these words are often used may be seen in the very common instance of calling anything 'a subject of investigation.'

SUBLEYRAS, PIERRE, was born at Usez in 1699. His father was his first instructor in painting, but at the age of fifteen he placed his son with Antoine Rivalz, a painter of reputation in Toulouse. In 1724 Pierre Subleyras went to Paris, and two years afterwards obtained the grand prize given by the French Academy, for painting a picture of the Brazen Serpent. He was accordingly sent in 1728 to Rome, with a pension from the government, and he remained there. In 1739 he married a Roman lady, Maria Felice Tibaldi, a distinguished miniature painter, and they were both elected members of the academy of St. Luke. Subleyras was patronised by the popes Clement XII. and Benedict XIV., by several cardinals, and many of the Roman nobility. He painted Benedict's portrait, and was commanded by that pope to execute one of the altar-pieces for St. Peters, to be worked in mosaic. He died at Rome of pulmonary consumption, May 28, 1749, aged 50.

There are several fine pictures by Subleyras in Rome and in some other cities of Italy, and a few in France: there are eight in the Louvre. His execution was delicate, he composed well, and was an agreeable colourist.

SUBLIMATION, a chemical operation effected by the application of heat to certain bodies. It is essentially similar to distillation in principle, but differs from it in the nature of the substances to which it is applied. In distillation liquids are first converted into vapour, and then condensed into a liquid form by the cooling agency of water; whereas in sublimation solid bodies are vapourised, and afterwards re-assume the solid state, in general merely by the cooling power of the air, without the assistance of cold water.

Sublimation is usually conducted in one vessel, the product being deposited in the upper part of it in a solid state, while the impurity remains in the lower. In small experimental researches a Florence flask answers perfectly well.

SUBLIME. (Geometry.) It may be worth while to state in few words, and to prevent a beginner in the older mathematicians from imagining that they spoke rhapsodically, that the term *sublime geometry* was technical, meaning the higher parts of geometry, in which the infinitesimal calculus or something equivalent was employed.

SUBLIMITY has two significations: one, that of the quality or circumstance in *objects* which raises the emotion named sublimity; the other, that of the emotion itself. This distinction has been combated as an error by almost all the Scotch writers—Kames, Stewart, Brown, Alison, Jeffrey, &c., when the truth is, that no such error was ever entertained by any correct thinker. The generality of people may conceive beauty and sublimity to be qualities of objects without respect to their emotions, as they regard sound, taste, smell, &c., to be qualities of objects without respect to the senses; for the law of the common mind has eminently what the Germans call an objective tendency, that is, a tendency to believe in its own sensations and emotions as things distinct from themselves; but no philosophical thinker of the last century has ever fallen into this error, and when Dr. Thomas Brown refutes, with so much pretension, the theory of the one universal sublime as a specific object to which there is a corresponding faculty of perception in the subject, he is combating a chimæra.

It appears to us that the true method of attaining the knowledge of this special law of emotion, is the method of all psychological inquiries, namely, induction. Before attempting to detect the law which regulates it, we must collect all or a vast number of instances of the sublime, and, analysing the elements of each case, endeavour to discover one primal element which is invariably a constituent of the emotion, and without which all the other constituents would not be able to form that special emotion of sublimity.

In proposing a new theory, founded on a wider range of induction than has been taken by preceding writers on the subject, we may observe that if any one instance of the universally acknowledged sublime can be found in which no such element (as the one we assert to be the ruling principle) be detected, then that single instance is a proof of the incompleteness of our theory, and a more extensive induction will be necessary.

It will be necessary for the sake of clearness to make use of purely mental distinctions in treating this subject, though they are liable to be misinterpreted as real distinctions. Accordingly we divide the question of the sublime into three:—1. The material sublime, or the sublime of nature. 2. The moral sublime, or the sublime in human actions and ideas. 3. The emotion of sublimity, which these external things excite in us, or that *feeling* in the mind which gives to certain phenomena of nature, or deeds of man, the attribute of sublimity. Speaking *objectively*, the exciting cause of sublimity is vastness; speaking *subjectively*, the emotion excited is a sense of insignificance.

1. The Material Sublime. Examine every case of material sublimity, and the most primitive fact will be found to be vastness. Whatever feelings may simultaneously concur, this of vastness is invariable. Mere vastness is sublime,—vastness either of form or of power. Hampstead Heath is not sublime, but Mont Blanc is. The Thames is not sublime, but the ocean is. Yet, to show how mistaken Burke was when he said that terror was the 'ruling principle' of the emotion, we all

know that there is as much danger on the Thames as on the ocean when it is calm. Solitude is sublime, because it is vast, that is, indefinite. But solitude in a room or garden is not sublime. A cataract is sublime, but not a waterfall, yet the one is only larger than the other. Longinus has remarked that the sight of a small fire produces no emotion, but that the boiling furnaces of Ætna, pouring out whole rivers of liquid flame, is sublime. Burke remarks that all general privations are sublime because terrible, such as vacuity, darkness, solitude, and silence. But they are sublime because vast, not because terrible; for they are not necessarily terrible, and they are necessarily vast, indefinite.

2. The Moral Sublime. It is obvious that the moral sublime must differ from the material sublime in proportion as mind and matter differ. Hence vastness, which in the external world is superficial (*in extenso*), in the moral world becomes intense (*in intenso*). Intensity of will equals vastness of form or power. Mere intensity is sufficient to produce the sublime. Œdipus is sublime. Lear, who appeals to the heavens, 'for they are old' like him, is sublime, from the very intensity of his sufferings and his passions. Lady Macbeth is sublime from the intensity of her will, which crushes every female feeling for the attainment of her object. Scævola with his hand in the burning coals exhibits an intensity of will which is sublime. So is also the celebrated 'qu'il mourut' of Horace in Corneille's tragedy, where a father's love is conquered by a more intense feeling of the honour of his country.

Such appear to us to be the objective qualities of sublimity, but the peculiar emotion they excite has hitherto been thought undefinable: we shall nevertheless attempt it.

3. The Emotion of Sublimity. As in considering objectively every case of material or moral sublimity, we found as the primary and invariable fact vastness or intensity, *so in considering subjectively* every case of sublimity as an emotion, we shall find the primary and invariable fact to be a sense of our own insignificance; of our inferiority to the object, or to the will which prompted the deed; and this sense of inferiority has guided mankind in the employment of a word expressing elevation for sublimity. Mere vastness excites this emotion by exciting a corresponding sense of our smallness. Mere intensity excites this emotion by exciting a corresponding sense of our feebleness. Vary the objects—vary the emotions as you may, there will invariably be this one feeling of comparative insignificance. Take as an example the sublime words of Scripture, 'I am the High and the Lofty One, who inhabiteth eternity.' Nothing can exceed the grandeur of that idea, and he who conceives it conceives also at the same time the corresponding idea of his own small and finite nature. In the violent dashing of a cataract, in the roar of the ocean, in the violence of the storm, or in the majestic quiet of Mont Blanc, preserving its calm amidst all the storms that play around it, or in the concentrated will of a Scævola, Horace, Brutus, or Œdipus; in all these cases we are moved by a vivid feeling of some greater power than our own, or some will more capable of suffering, more vast in its strength, than our feeble vacillating will. It is from this reason that an imaginative mind experiences more emotions of sublimity than another. In proportion as we comprehend the majesty of nature, or the amount of self-sacrifice in an heroic action, we comprehend our own inferiority to them.

The sublime and the beautiful are two very distinct and dissimilar emotions. The beautiful is founded on emotions of the pleasurable, and its varieties are as infinite as the varieties of objects which excite pleasurable emotions. The sublime is founded on an emotion of our insignificance, and its varieties are as limited as the varieties of objects which excite the feeling of insignificance.

In conclusion, we may thus sum up our theory. The invariable condition of sublimity in objects, either material or moral, is vastness or intensity. The invariable condition of the emotion of sublimity—that which distinguishes this emotion from every other emotion—is a comprehension of this vastness with a simultaneous feeling of our own comparative insignificance, together with the concomitant sense of present security from any danger which might result from this superior power. The antithesis to the emotion of sublimity is the emotion of contempt.

SUBMARINE DESCENT. Much ingenuity has been devoted from an early period to the contrivance of apparatus for enabling men to descend beneath the surface of water, to a greater depth, for a longer space of time, and with less exertion and danger, than is possible by the unassisted powers of the body. Machines which in some degree included the principle of the Diving-Bell, were suggested, contrived, and sometimes used for the purpose of obtaining property sunk in the sea or in rivers. At length, in the 16th century, the Diving-Bell itself was invented and used; and Halley, in No. 349 of the 'Philosophical Transactions,' describes its defects, and suggests a remedy for them. In its simplest form the diving-bell is a strong heavy vessel of wood or metal, made perfectly air and water-tight at the top and sides, but open at the bottom. If such a vessel be gradually lowered into the water, in a perfectly horizontal position, the air which it contains cannot escape, and therefore the vessel cannot become full of water. Where the diving-bell is used for descending to a very small depth, as the pressure of the water is small, it will not rise in the bell to a sufficient height to be inconvenient; but at the depth of thirty-three feet the pressure is so great as to compress the air into one half its original volume, so that the bell will become half full of water; and at a greater depth the air will be still more compressed, and the water will rise proportionately higher in the bell. The unpleasant pressure of the condensed air on the ear, the difficulty of breathing, and the confinement of space within the bell, have all led to various improvements, by Dr. Halley and others.

The diving-bell used by Dr. Halley was of wood, in the form of a truncated cone, five feet in diameter at the bottom, and three feet at the top, and containing about sixty cubic feet. This was coated with lead, and so weighted about the lower

part that it would sink while empty, and would always remain in its proper position; that is, with the large open end downwards, with its rim parallel with the horizon. In the top of the bell was a very strong glass window, and a cock, by opening which the foul air might be allowed to escape. About a yard below the mouth of the bell was suspended a stage, so weighted that it might hang steadily. The apparatus for conveying air to the diving bell consisted of two barrels, holding thirty-six gallons each, weighted with lead to make them sink readily. Each of these had an open bung-hole in the lower end, to allow water to enter during their descent, so as to condense the air; there was also a hole in the upper end of each, to which was fitted an air-tight leathern hose, long enough to fall below the bottom of the barrel, and having its loose end so weighted that it would fall naturally into that position. When the open end of the hose was turned up by the attendant, so as to be above the level of the water in the barrels, the air rushed out with great force into the bell, the barrels becoming at the same time full of water. By sending down these air-barrels in rapid succession, the air in the diving-bell was kept in so pure a state that five persons remained in it, at a depth of nine or ten fathoms, for more than an hour and a half at a time, without injurious consequences. When the sea was clear, and especially when the sun shone, sufficient light was transmitted to allow a person in the bell to write or read; and when the sea was troubled and thick, which occasioned the bell to be as dark as night, a candle was burnt in it. Halley sometimes sent up orders with the empty air barrels, writing them with an iron pen on plates of lead.

The credit of having been the first to apply the diving-bell in aid of civil engineering operations is usually attributed to Smeaton, who used it in 1779 in repairing the foundations of Hexham Bridge. The bell used on this occasion was an oblong box of wood, four feet high, two wide, and three and a half long; and it was supplied with air by a pump fixed on the top. The river being shallow, the bell was not covered with water. In 1788 the diving-bell was used in a much more important work, Ramsgate harbour, by the same engineer. The depth here being considerable, an apparatus was employed for sending in a supply of air through a flexible pipe, by means of a forcing-pump. The bell used was of cast-iron, similar in form to that employed at Hexham, but four feet and a half high, four and a half long, and three wide. Its weight was fifty cwts., and the thickness was so adjusted that it would, without the addition of any weights, sink in the proper position. In levelling foundations under water by this machine the surface of the water at the bottom of the bell formed a convenient and unerring level to work to; and in this, as well as in the subsequent operation of building, every necessary motion was given to the bell by the tackle by which it was suspended; signals being made from below by striking one, two, three, or more blows upon the side of the bell with a hammer.

Since the time of Smeaton the diving-bell has been frequently, and with great advantage, employed in submarine works; sometimes in situations in which it would have been impossible to construct a coffer-dam, or to perform the required operations by any other means. The diving-bells used in such works are usually formed on the model of that made for the works of Ramsgate Harbour; but the mode of suspension differs according to circumstances. The bell may be suspended over the side or end of a vessel; or through an opening in the centre of a barge; or from framework resting upon two barges, placed parallel with each other, but at such a distance apart as to allow the bell to descend between them; or from a scaffolding supported by piles. Of the use of this important machine in recovering property from wrecks, the operations upon that of the Royal George afford a familiar example. Smeaton's method of supplying air to the bell is that most commonly employed; but that of Halley may, in some cases, have the advantage. One of the largest diving-bells ever constructed is that at the Polytechnic Institution.

Many plans have been proposed for enabling a man to walk beneath the surface of water in such a manner as to assist in the recovery of property from wrecks, by means of waterproof coverings for the head and upper part of the body, or of strong vessels in which every part but the arms should be encased; a supply of air being either transmitted from above by a flexible pipe, or contained in the cavities of the protecting armour. Dr. Halley devised such an apparatus. The diver's head was covered by a heavy leaden cap, supplied with air by a flexible tube extending from the large bell. The diver was to coil this tube round his arm, and unwind it as he left the bell; and to use it as a clue to direct him to the bell in returning. This pipe was formed of leather soaked in oil and hot wax, and was held open by a spiral coil of brass-wire; its internal diameter being about one-sixth of an inch. The front of the helmet was glazed; and the diver, who was clothed in a thick woollen dress, fitting close to the body, to diminish the effect of the coldness of the water, was enabled to walk by means of a weighted girdle and weighted clogs. The invention of water-proof India-rubber cloth, which has been applied in various ways to diving-apparatus, affords great facilities for the manufacture of water-tight tubes for such a purpose. Many varieties of diving-dresses have been since employed. Mr. Thornthwaite introduced a few years ago a contrivance for facilitating the descent and ascent of a diver. It consists of a hollow belt of India-rubber cloth, to which is attached a small but strong copper vessel. Into this vessel air is to be forced by a condensing-syringe until it has a pressure of thirty or forty atmospheres. The belt is then put on, in a collapsed state, so that it has no buoyancy, and does not impede the descent of the diver; but when he desires to rise, he opens a valve, by which the condensed air escapes from the copper vessel into the belt. As it expands the belt, it affords sufficient buoyancy to raise the diver immediately to the surface.

SUBMYTILA'CEA, M. de Blainville's name

for his sixth family of *Lamellibranchiata* (Bivalve Mollusks).

The following is his definition of the *Sulmytilacea*:—Mantle nearly as in the *Mytilacea*, that is to say, adherent, and slit throughout its lower part, with a distinct orifice for the anus and a commencement of a tube for respiration by means of a particular disposition of its posterior extremity, which is furnished with tentacular papillæ; a large fleshy abdominal mass for locomotion, without byssus at its base; two distinct muscular impressions.

Shell free, subnacreous, regular, equivalve; dorsal hinge lamellar, ligament external; two muscular impressions with the pallial impression which unites them not excavated backwards.

M. de Blainville remarks that this family are more or less inhabitants of mud, and are locomotive by means of their foot.

He divides them into two sections:—

1. The *Limnoconchs* (*Limnoderma*, Poli). All these have an epidermis, are nacreous, and are inhabitants of fresh waters.

2. Species without any evident epidermis, not nacreous, and more or less pectinated. Marine.

Under this section M. de Blainville arranges but one genus, *Cardita*.

SUBOSTRA'CEA, M. de Blainville's name for his second family of *Lamellibranchiata* (Bivalve Mollusks).

Mantle open nearly throughout its circumference, retractile, and not adherent; branchiæ not united throughout the median line, so as to expose the abdomen, which has the rudiment of a foot often canaliculated with the rudiment of a byssus.

Shell of a close texture, subsymmetrical, always more or less auriculated, with a subcomplicated hinge; a single subcentral muscular impression, without any trace of the pallial ligula.

Genera.—*Spondylus, Hinnites, Pecten, Pedum, Lima.*

SUBSIDIARY. A quantity or symbol is so called when it is not essentially a part of a problem, but is introduced to help in the solution.

SUBSIDY, from *subsidium*, a Latin word signifying aid or assistance. 'Subsidies,' says Lord Coke, 'were anciently called auxilia, aides, granted by act of parliament upon need and necessity; as also for that originally and principally they were granted for the defence of the realm and the safe keeping of the seas,' &c. [AIDS.] The word used in its general sense was applied to aids of every description.

Subsidy in its more usual and limited sense consisted of a rate of 4*s.* in the pound on lands, and 2*s.* 8*d.* on goods, and double upon the goods of aliens. The taxes called Tenths and Fifteenths were the 10th or 15th part of the value of moveable goods. Other portions, such as the fifth, eighth, or eleventh part, were sometimes, but rarely, also levied. These taxes seem to have had a parliamentary origin. The mode of levying subsidies must have been very incomplete, for the amount continued decreasing instead of increasing. In the eighth year of the reign of Elizabeth it amounted to 120,000*l.*, in the fortieth to 78,000*l.* only. Lord Coke estimates a subsidy (probably in the reign of James I. or Charles I.) at 70,000*l.*; the subsidy raised by the clergy, which was distinct from that of the laity, at 20,000*l.*; a fifteenth at about 29,000*l.* Eventually the subsidy was abolished, and a land tax substituted for it.

SUBSTANCE. In general usage Substance means a solid. In philosophical speculations it has undergone the fate of most general terms, and has been tortured into all possible shades of meaning. In physical speculations it has usually been taken as an equivalent to matter; but in metaphysical speculations its meaning has remained true to its etymon (*substans*, that which *stands under* phenomena).

As we know that all phenomena must depend upon noumena, of which they are only the manifestation; or, to use the language of the schoolmen, as all accidents must be accidents of something, and must depend on that something for their existence, so in pushing our analysis to its limit, we must finally arrive at a point to which we can give no antecedent, which we are forced to assume as final, and as standing under or supporting the whole, and this we call Substance. It is the fundamental fact of all existence. We can never know it, for we know only phenomena, which are its appearances. We can never conceive it, for the first attempt to conceive it brings it within the sphere of our ideas, which are only those of phenomena. We can never imagine it, but we are compelled to assume it.

SUBTENSE means any line, angle, &c., opposite to or *subtending* a line or angle spoken of. Thus the chord of a circle is the subtense of the arc and of the angle at the centre. The term is now not much used.

SUBTRACTION. The process of subtraction is the removal of a part equal to the less from the greater. The quantity to be diminished (*minuendum*) was called the *Minuend*; the quantity to be withdrawn (*subtrahendum*) the *Subtrahend*; and the remaining part the *Remainder*. The terms subtrahend and minuend are almost out of use, though often very convenient.

The operation of subtraction is often described in a way which might be practised, but is not; and the explanation of the possible mode applied to the actual mode makes confusion. It is obvious enough that if parts of A be subtracted severally from greater parts of B, the remainders put together make up the whole remainder. Thus 24 can easily be taken from 76, for 7 tens exceeds 2 tens by 5 tens, and 6 exceeds 4 by 2, so that 52 is the remainder required. But when we come to take 48 from 93, the preceding mode of partition is useless. To remedy this it is proposed in the explanation to *borrow* one of the nine tens in 93, and to put it on to the 3: then 8 from 13 leaves 5. Now take the four tens of 48, and subtract from the *remaining* 8 tens of 93, and 4 tens are left; the answer then is 45. The process would be as follows:—

93	8 from 3, impossible: borrow a ten from
48	90; 8 from 13 leaves 5. Take 4 tens
—	from the remaining 8 tens, one of the 9
45	tens having been borrowed, and 4 tens remain.

This process is actually used on the Continent, but with us, as all the world knows, there is a different process, as follows:—

93 | 8 from 3, impossible: take 8 from 13, and
48 | 5 remains. *Carry* one to 4, giving 5,
— | and subtract 5 tens from 9 tens, giving
45 | 4 *tens*.

There is quite a different principle in this process, which is as follows:—If two numbers be equally increased or equally diminished, the difference remains the same. Having arbitrarily increased the three in the upper line by ten, the lower line must be somewhere or other increased by ten, in order to keep the difference (which is all that is wanted) unaltered.

The object in view is attained by increasing the upper line by ten *units*, and the lower line by one *ten*.

SUBULA'RIA (from *subula*, an awl, from the form of the leaves), a genus of plants belonging to the natural order *Cruciferæ* and the tribe *Subularieæ*. *S. aquatica*, Awlwort, is a native of the colder parts of Europe, in ditches, lakes, and rivulets with a sandy or gravelly bottom. It is also found plentifully in the north of England, Scotland, and Ireland.

SUBULICORNES (Latreille), a section of Neuropterous insects containing the Dragon-Flies (*Libellula*, Linn.) and the *Ephemeræ*. The larvæ of these insects are carnivorous, and live in the water, respiring by means of appendages situated on the sides or extremity of the body; the pupæ also live in the water, but leave that element to undergo the final transformation. In the perfect insect the wings are always reticulated, and when at rest are in some species horizontal, in others vertical; the compound eyes are very large and prominent; and the ocelli, or simple eyes, are two or three in number; the mandibles and maxillæ are covered by the labrum and labium; the antennæ are short, slender, and subulate.

The *Subulicornes* are divided into the following leading families—*Libellulidæ* (Dragon-Flies) and *Ephemeridæ* (May-Flies), of which latter several species are very acceptable to the trout-fisher. Ephemeræ, or May-Flies, often appear along the borders of rivers in multitudes innumerable, darkening rails, posts, stones, and other resting places, while clouds of the same insects render the air overhead completely turbid.

SUCCESSION is a legal term derived from the Roman 'Successio,' which signifies a coming into the place of another, and Successor is he who *comes into* such place.

The Roman term signifies a coming into the place of another so as to have the same rights and obligations with respect to property which that other had. There might be a successio either by coming into the place of a person living, or by becoming the successor of one *who was* dead. Gaius (iii. 77, &c.) gives instances of successio in the case of persons living, one instance of which is the Bonorum Cessio according to the Lex Julia. Succession was again either Universal or Singular. The instances of universal succession (per universitatem) which Gaius (ii. 97) enumerates, are the being made a person's heres, getting the possessio of the bona of another, buying all a man's property, adopting a person by adrogatio, and admitting a woman into the manus as a wife; in all which cases all the property of the several persons enumerated passed at once to the person who was made heres, or got the bonorum possessio, or bought the whole property, or adopted another by adrogation, or married the woman. An instance of singular succession is the taking of a legacy under a man's will.

The term Succession is used in our language. We speak of the succession to the crown or the regal dignity, and the term implies that the successor in all things represents the predecessor. The king, as a political person, never dies, and upon the natural death of a king the heir immediately succeeds. The English heir at law takes the descendible lands of his ancestor as universal successor; and the executor takes the chattels real and other personal property of his testator as universal successor. The general assignee or assignees of a bankrupt or insolvent take by universal succession. The word Succession is often used incorrectly by law writers, even in acts of parliament.

SUCCINAMIDE. When dry succinic acid is acted upon by ammonia, water is given off with the evolution of heat, and a fusible crystallisable substance is formed, soluble in water and in alcohol. This is *Succinamide*, which consists of C^8 H^5 O^4 N^1. When crystallised it contains two equivalents of water.

SUCCI'NEA, M. Draparnaud's name for a genus of Pulmoniferous Gastropods belonging to the *Colimacea* of Lamarck and the *Limacinea* of De Blainville. It is the subgenus *Cochlohydra* of Ferussac.

The shell is ovate, rather elongated, with a large, entire, longitudinal aperture, and a short spire; the outer lip is thin and continuous with the delicate sharp-edged columella: the inner lip is spread over a part of the body-whorl. The shell may be distinguished from that of *Limnæa* by its not having a fold or plait on the columella.

Cuvier, who places the genus between *Chondrus* and *Clausilia*, remarks that the animal cannot withdraw itself into the shell entirely, and that it may be regarded almost as a *Testacella* with a large shell. It has, he remarks, the lower tentacula very small, and lives on the herbage and plants on the brinks of streams, whence it has been considered as amphibious.

The most familiar species is *Succinea amphibia*, *Helix putris* of Linnæus, which is common in moist places, on the banks of fresh waters.

SUCCINIC ACID is obtained from amber by the application of heat. It is produced in the form of crystals, which are colourless, inodorous, acid, acrid, and sublime without decomposition when heated. When heated to 356° the crystals lose half their water. This acid consists of C^4 H^2 O^3. The crystals contain one equivalent of water. Succinic acid (which was formerly employed in medicine under the name of *Salt of Amber*) combines readily with the alkalies, earths, and metallic oxides. Several of its compounds with the latter are crystallisable, but are not applied to any particular purpose.

SU'CCINUM is a bituminous substance of a peculiar kind, procured from amber. It is not now used in the crude state in medicine, but is employed to yield the Oleum Succini, or Oil of Amber.

Volatile oil of amber probably contains a large portion of creasote, as may be inferred from the analogous action of nitric acid on it and on creasote. One part of rectified oil of amber, and three parts of moderately strong nitric acid, form a magma, which has the odour of musk, and is called *Artificial Musk*. Rectified oil of amber is stimulating, antispasmodic, and rubefacient. It is now little given internally, except in combination with ammonia, in the celebrated *Eau-de-Luce*, for which the *Tinctura Ammoniæ Composita* of the present Pharmacopœia is a substitute.

SUCCORY, commonly called Chicory, or Wild Endive, is the *Cichorium intybus* of botanists, and belongs to the tribe *Cichoraceæ* and natural family *Compositæ*. [CHICORY.]

SUCCULA'TÆ, the name of a natural order of plants in the 'Fragments of a Natural System' of Linnæus, adopted by Bartling. It includes those families which are remarkable for the succulent character of their leaves, as *Saxifragaceæ*, *Crassulaceæ*, *Ficoidaceæ*, &c.

SUCHET, LOUIS GABRIEL, *Duke of Albufera* and Marshal of France, was a native of Lyon, where his father was a silk manufacturer. He was born about 1770. On the breaking out of the French Revolution, he entered as a volunteer in the cavalry of the national guard of Lyon; shortly afterwards, he became captain of a volunteer company raised in the department of Ardèche, which he commanded during four months, when he was raised to the grade of 'chef de bataillon.' He was present at the siege of Toulon in 1793; thence he was transferred to the army of Italy, and was attached to the brigade under the command of General Laharpe. In this campaign he specially distinguished himself at the combat of Loano (Nov. 23, 1795). He afterwards served with distinction under Generals Augereau and Masséna, and received several wounds. It was on the field of battle of Neumark (April 2, 1797) that he was raised to the rank of 'chef de brigade.' He afterwards joined the army in Switzerland, and the important part he acted in the next campaign was recognised by General Brune, who sent him to Paris to present to the Directory twenty-three standards taken from the enemy.

When the expedition to Egypt was determined upon, Suchet was retained in Italy with the rank of major-general of brigade. In his new command he made strenuous endeavours to renew the ancient discipline and to ameliorate the condition of the soldier; these endeavours were construed by the government of Paris into an attempt to introduce in the army an aristocratic rule. He was recalled; but having cleared himself of the charges which had been brought against him, he was transferred to a command in the army of the Danube. When Joubert was a second time entrusted with the chief command in Italy, Suchet was recalled from the Danube, and placed at the head of Joubert's staff. The campaign which ensued added greatly to his military reputation; and when Bonaparte joined the Italian army Suchet was appointed second in command to Masséna. In this capacity he particularly distinguished himself in the actions at San Bartolomeo and the bridge of Cezio (7th and 8th May, 1800). He then rejoined Masséna, and was present at the battle of Marengo. When the city of Genoa again fell into the hands of the French, the government of it was given to Suchet. At the conclusion of the armistice of six months, between the French and Austrians, the command of the centre of the army of Italy was confided to him. During the peace concluded in 1801 between Germany and France, Suchet was engaged in the superintendence of military works, and finally promoted to the governorship of the castle of Lacken, near Brussels, having been previously named member of the Legion of Honour.

On the opening of the campaign of 1805 Suchet was attached to the division of the army under the command of Marshal Lannes. At the battle of Austerlitz he commanded the left wing of that division.

When the war broke out in Spain in 1808, Napoleon gave him the command of the fifth division of the army, having previously raised him to the highest grade of the Legion of Honour, with the title of Count of the Empire. After assisting for a short time at the siege of Saragossa he was appointed to the command of general-in-chief of the French army in the province of Aragon. He defeated O'Donnell and took Lerida, Tortosa, Tarragona, and other places. Suchet's brilliant services during this campaign were appreciated by Napoleon, who rewarded them by raising him to the dignity of a Marshal of the Empire. In the latter end of 1811 Suchet directed the operations of his army against Murviedro, the ancient Saguntum; and the defeat of General Blake under its walls was followed, after about a month's siege, by the fall of this important fortress. Valencia surrendered in January, 1812, and Napoleon created him Duke of Albufera. But he obtained a higher title to the respect of posterity by the expressed feelings of the Spaniards under his rule, that he mitigated the horrors of war by his humanity, and dealt equal justice to the conquerors and to the conquered.

The success which attended the British arms under Lord Wellington, compelled Suchet to fall back upon Catalonia, where he maintained himself for some time. Obliged at length to retreat towards the frontiers of France, he, on reaching Narbonne, signified, April 14, 1814, his adhesion to the decrees of the senate, directed against Napoleon. Employed to receive Ferdinand VII., who had been released from Valençay, and to present him to the Spanish army, he was publicly thanked by the king for the manner in which he had carried on the war against his subjects.

The adhesion of Suchet to the Bourbons was rewarded by his being created a member of the new peerage, and his appointment to the command of the tenth military division, of which the head-quarters was Strasbourg. After the return of Napoleon from Elba, he renewed his allegiance to

his former chief, and accepted the command of the army of the Alps. On the second restoration of the Bourbons he remained for some time in disgrace, and was deprived of his civil honours. He was however restored to his position in the peerage by a royal ordinance, dated March 5, 1819. He died at Marseille, Jan. 7, 1826. During the latter years of his life he was occupied in composing a memoir of his campaign in Spain, which has since been published. ('Mémoires de Suchet,' 2 vols., Paris, 1826.)

SUCKLING, SIR JOHN, was born at Whitton, in Middlesex, 1508–9. His father was one of the secretaries of state and comptroller of the household to James I. In 1623 he matriculated at Trinity College, Cambridge, and in 1628 travelled abroad. In 1631 he joined the army of Gustavus Adolphus, king of Sweden, and probably remained on the Continent till 1632. On his return to England he led the life of a courtier, and was distinguished not less by his wit than by the splendid appearance which he maintained. About this time we find the first notice of him as an author; in 1637 was published his 'Session of the Poets;' in 1638, his 'Aglaura,' and in 1639, his 'Brennoralt,' under the title of 'The Discontented Colonel,' a satire on the rebels. When the disturbances broke out in Scotland, Suckling equipped a troop of 100 horse in the king's service, and so magnificently that they cost him, it is said, 12,000*l*. In 1640, on the meeting of the Long Parliament, Suckling was returned member for Bramber, and took an active share in the party strife that followed. In 1641 he joined in a plot to rescue Strafford from the Tower, and was summoned before parliament, and accused of being an accomplice in a design to bring over the French. Upon this he fled to France, and died soon afterwards in that country, probably before 1643.

His works are:—'Fragmenta Aurea,' London, 1646, 8vo., with a portrait of the author, containing Poems, Letters, and an Account of Religion by Reason; 'The Goblins;' 'An Account of Religion by Reason;' 'Letters to several Persons of Honour;' 'The Sad One,' a tragedy. Works, consisting of Poems, Plays, Letters: several editions between 1709 and 1770.

SUCTORIAL CRUSTACEANS. M. Milne Edwards, in his valuable 'Histoire Naturelle des Crustacés (Suites à Buffon),' remarks that this great division of the class *Crustacea* is connected intimately with the *Entomostraca*, and especially to the order *Copepods*, and he acknowledges that it would have been perhaps more natural not to separate it so definitely from them as he has done. For the rest, he adds, the group is distinguished from all the animals of the same class by the conformation of the buccal apparatus. In fact, he observes, the mouth, instead of being furnished with foliaceous jaws and mandibles proper for dividing solid aliments, is prolonged into the form of a beak, and cannot give passage to any but liquid substances. These crustaceans therefore are nourished by the juices which they obtain from the bodies of other animals only; and this organic disposition renders them essentially parasitic. But this peculiarity of structure, notwithstanding all its physiological importance, brings with it rather slight anatomical differences; for, in the crustaceans, as in the insects, the same parts are modified in their form, to constitute, according to demand, an apparatus of mastication, or an organ of suction. This last is essentially composed of a conical tube resulting from the elongation of the labrum and the lower lip. There are almost always to be found two styliform pieces, which are evidently the analogues of the mandibles of the masticating crustaceans, but which here fulfil the office of small lancets, or rather, of the instrument employed in surgery in dropsical cases known as the trochar. Lastly, there exists ordinarily on each side of the base of this beak other appendages, the principal of which appear to represent the jaw-feet of the superior crustaceans, and serve the animal as the instruments to hook or attach itself to its prey. The feet are, in general, formed as in *Cyclops* and the other Copepods, that is to say, they are short and furnished with two natatory oars composed of many joints, and it is worthy of note, that, in the greater part of the crustaceans, the number of these organs amounts to but four pairs; but, in the group before us, they become deformed by age, and sometimes completely disappear. Another trait of resemblance between the Suctorial Crustaceans and the Copepods, is furnished by the metamorphoses which they undergo in their youth; and it is a remarkable fact, that whilst in the adult state they offer the most variable forms, they have at their birth the ordinary conformation in all the young Copepods, and the greater part of the young Branchiopods; in the first period of their existence it is even impossible to distinguish them from the young Cyclops.

M. Milne Edwards remarks that this subclass divides itself naturally into two principal orders, and he has thought it right to add a third provisionally. This last, he observes, is ordinarily arranged by zoologists among the *Arachnids* [ARACHNIDA], but he is of opinion that their more proper place is in the class *Crustacea*. The three orders proposed by M. Milne Edwards are the *Siphonostomes*, the *Lerneans*, and the *Aruneiform Crustaceans*.

These singular animals are parasites upon fishes, or within their gills; also in the gills of lobsters, shrimps, &c., and upon the tadpoles of Batrachians; and not unfrequently they are to be found free, swimming about with vivacity.

Some of the *Siphonostomes*, although they ordinarily live as parasites on fishes, are not permanently fixed to them; and when they let go their hold, they can change their place either by crawling slowly or swimming. The male is, in general, distinguished from the female by some peculiarities of structure, and by a very inferior size. The female nearly always carries her eggs in cylindrical tubes, which spring near the posterior border of the last thoracic segment on each side of the abdomen, and which often attain a very considerable length. The young, at their birth, resemble the young of *Cyclops*, and must undergo many moults before they finish their me-

tamorphosis. Little however is known at present of these changes.

Examples.—*Argulus foliaceus*, well known to most anglers, and figured in Yarrell's 'British Fishes,' p. 399; found on the Pike, Trout, &c. *Caligus Mülleri*, common on the Cod, &c. Of the *Lerneans* we may adduce as examples the *Tracheliastes polycolpus*, found on the fins of the Chub; *Basanistes salmonea*, found on the Grayling; and *Lerneopoda elongata*, found fixed to the eye of a shark in the Polar Seas. One species, *Lernea Spratti*, infests the sprat, and is luminous at night; it is well known to the fishermen of our coasts.

The *Araneiform Crustaceans*, or *Pychnogonids*, are strange-looking little creatures, living in the sea. Some are found under stones, others attach themselves to fishes, but of their habits little is known. Example, *Pychnogonum littorale*, a native of our seas, and those of the adjacent continent.

The reader should refer to the writings of Fabricius, Latreille, Brunnich, Montagu, Lamarck, Leach; and especially of Dr. Johnston, in 'Zoological Journal,' and 'Magazine of Zoology and Botany,' relative to this highly-interesting order of animals.

SUDBURY. [Suffolk.]

SUDORIFICS. [Diaphoretics.]

SUET is a variety of the fatty or adipose tissue of animals, accumulated in considerable quantity about the kidneys and the omentum or caul, of several of the domestic quadrupeds. There are several kinds of it, according to the species of animal from which it is procured, such as that of the hart, the goat, the ox, and the sheep. When recent, it is white, easily broken, translucent if thin, and almost without smell; it soon becomes rancid and yellow by exposure to the air.

Suet consists of about three-fourths of stearin, with some elain, and a little hircine, and margarin. The preponderance of stearin renders it the most solid of animal fats. It liquefies with a gentle heat, and the prepared suet of the Pharmacopœia is obtained by melting it over a slow fire, and straining it, to separate the membranous portion. It is used as an ingredient in cerates, plasters, and ointments. By pouring it when melted over various articles, such as potted char, from which it thoroughly excludes the air, it assists greatly in preserving them.

SUETONIUS (CAIUS SUETONIUS TRANQUILLUS). The time of his birth is not known, but as he states that he was a young man (adolescens) twenty years after the death of Nero, the time may be fixed approximately. There are extant several letters from Pliny the Younger to Suetonius, from one of which (i. 18) it appears that Suetonius was then practising at the bar. At the request of Pliny, Trajan granted Suetonius the Jus Trium Liberorum, by which he obtained all the privileges of those who actually had children, and was freed from the disabilities imposed by the Lex Julia et Papia Poppæa on those who were married and had no children. He was Magister Epistolarum to Hadrian, but lost his office at the same time that Septitius Clarus, who was Præfectus Prætorii, and many others, were dismissed by Hadrian.

Pliny calls Suetonius a most upright and learned man. He was a voluminous writer, but the only complete work which remains is the 'Lives of the Twelve Cæsars,' comprehending the Cæsars from C. Julius Cæsar the dictator, to Domitian, both included. Suetonius did not write his Lives strictly according to the order of events, but after a manner of his own. The style is correct, brief, and perspicuous, except where the subject matter causes a difficulty. It is of the anecdotical character. These biographies abound in curious facts, and furnish abundant historical materials. They contain all the scandal that circulated as to the private life of the emperors, and probably many things that are not true. They are however very valuable for the great variety of matter which they contain on affairs of more importance than the follies and vices of the Cæsars.

There are numerous editions of Suetonius. There is a small useful edition, with a selection of notes, by J. Schild, 8vo., Leyden, 1647. Among the other editions are those of J. G. Grævius, Burmann, Oudendorp, and Ernesti. The 'History of the Twelve Cæsars' was translated into English by Philemon Holland, fol., London, 1606. There are four other English translations, the last of which is by A. Thomson, 8vo., London, 1796, 'with annotations, and a review of the government and literature of the different periods.'

There is also extant a small treatise 'On Distinguished Grammarians,' by Suetonius; and another 'On Distinguished Rhetoricians,' consisting at present of only six chapters. There are also extant the following Lives by Suetonius: the Lives of Terence, Juvenal, Persius, Horace, Lucan, and the elder Pliny; the last is only a few lines.

SUETONIUS PAULINUS. [Boadicea.]

SUEUR, EUSTACHE LE, was born in 1617. After he had learnt from his father, an obscure sculptor of Mont Didier, the first rudiments of design, he was placed in the school of Simon Vouet at Paris. Le Sueur soon surpassed his master, and by assiduously studying the antique, and some of Raphael's pictures and the prints after him by Marcantonio, he adopted a style, which for its simplicity and severity contrasted greatly with that of Vouet and the French school of the time, and has placed the name of Le Sueur above that of any of his rivals.

The celebrated series of St. Bruno, of twenty-two large pictures, painted on wood, in the cloister of the Carthusians at Paris, was executed by Le Sueur before his thirtieth year; he completed it in three years, and was assisted only by his brother-in-law and scholar Goussé, or Goulai, in the figures, and by Patel in the landscapes. In 1766 these pictures were transferred to canvas, and are now in the Louvre. In 1649 he painted his celebrated picture of St. Paul preaching at Ephesus, and the Gentiles burning their proscribed Books, for the guild of the goldsmiths, to be presented to the cathedral of Notre Dame. Paul Healing the Sick, engraved by Bauzo and the elder Massard, and the Martyrdoms of St. Laurence and of St. Protais, both engraved by Gerard Audran, are also admirable compositions, conspicuous for their simplicity and severity. His

most extensive works however, by some considered his best, and which occupied him the last nine years of his life, were the mythological paintings of the Hôtel du Châtelet, executed for the President Lambert de Thorigny; they were removed to the Louvre in 1795. The palace of the Louvre was decorated by Le Sueur and Le Brun conjointly, and Le Sueur's works, which have been engraved by Picart, are considered superior to those of Le Brun. In 1655 Le Sueur's labours were terminated by his death.

When the Royal Academy of the Fine Arts was established in Paris, in 1648, Le Sueur was appointed one of the twelve ancients or professors; he had been previously elected a member of the Academy of St. Luke at Rome. His style had no influence upon the arts in Paris; his only scholars were his three brothers, Pierre, Philippe, and Antoine Le Sueur, Le Fevre, and Nicolas Colombel. His own portrait, painted by himself, has been engraved by C. N. Cochin. In Landon's 'Œuvres de Le Sueur' there are 110 prints from his works.

SUEZ, ISTHMUS OF, connects Africa with Asia, and separates the Mediterranean from the Red Sea. Its extent from north to south a little exceeds seventy-two miles. There once existed a canal on the isthmus, and numerous traces of it still appear in several places; it did not however unite the two seas, but only the Red Sea with the Nile. This canal was commenced by Pharaoh Necho and completed by Darius. (Herod., ii. 157.)

The whole tract, from Suez to Tyneh on the Mediterranean, is uninhabited. Drinkable water occurs only in one or two places. The Red Sea is nearly 33 feet higher than the Mediterranean, and a canal to unite these two seas would require locks; but the water of the whole isthmus would not be sufficient to feed one lock for a single day. A railway could be laid down with great facility, as there is no eminence worth naming. The surface consists, in general, of sandstone, converted into sand in many places by disintegration. The surface is not a level plain, but is interrupted by some depressions, in which are salt swamps or lakes. A depression of a somewhat different kind extends across the isthmus from Suez to Tyneh, not in a straight line, but diverging first to the west, and afterwards returning to the east, until it again reaches the straight line. In about 30° 10′ N. lat., it enters the swamps called the Bitter Lakes, the surface of which is 35 feet below that of the Red Sea. In the southern part of this depression the canal of Necho had been made, and the French executed their levellings in the deepest part of it. By this levelling it was discovered that the depression, in nearly its whole extent, is lower than the level of the Red Sea. Not far from the northern extremity of the Bitter Lakes (30° 30′ N. lat.) are the ruins of a temple of Serapis. At a short distance to the north of these ruins is another depression, containing a small lake called Temsah, which is dry during the greater part of the year, but filled with water when the inundations of the Nile have attained their greatest height. To the northward of Lake Temsah are the salt-marshes of Karâsh, and W. of these the stony ground in some places rises above the level of the Red Sea, and in others sinks some feet below it. Between the salt-marshes and the lake of Bellah is a similar stony country, of about the same elevation. East of these two lakes is a low stony uneven tract, which extends to 31° N. lat., where it joins the plain of Pelusium, which is about 30 feet below the spring-tides of the Red Sea. The plain is a dead flat, with a sandy arid soil, almost entirely destitute of vegetation, and in many parts covered with a thin layer of salt. When the water attains its greatest height in the Nile, it is almost entirely inundated. At the eastern extremity of the plain is the small village of Tyneh, and about a mile to the south-west of it are a few ruins, which are supposed to be those of the ancient town of Pelusium. The country which extends to the west of the line described is covered with horizontal strata of sandstone, and presents few inequalities, except towards the south, where, at the distance of about four miles, and south of 30° 20′, are the extremities of the ridges which lie between Cairo and Suez: an elevated hill occurs at a short distance from the western margin of the Bitter Lakes, and is the highest point of the isthmus. The country E. of the depression presents stony tracts in the vicinity of the two seas with a broad zone of sand between them.

SUEZ, a town situated at the head of the westernmost of the two arms or gulfs in which the Red Sea terminates, is in 29° 57′ 30″ N. lat., 32° 31′ 33″ E. long., and 62½ geographical miles east from Cairo. Suez is poorly walled on three sides, and open to the sea on the north-east, where is the harbour and a good quay. Within the walls are many open places, and several khans built around large courts. The houses are in general poorly built. There is a bazar, or street of shops, tolerably furnished with goods. The inhabitants are about 1200 Moslems and 150 Christians of the Greek church. The favourable position of the town for facilitating the transit of merchandise between the Red Sea and the Nile; the annual concourse of pilgrims who embark here for Mecca; and the regular plying of British steam-ships from this port to India have given an impulse to the prosperity of Suez, and somewhat increased its population; but from the want of fresh water, and of every kind of verdure and cultivation, it can never become more than a place of passage, which both the traveller and inhabitant will hasten to leave as soon as possible.

SUFFETES. [CARTHAGE.]

SUFFICIENT REASON. (Mathematics and Physics.) The principle which is connected with these words might be, and frequently is, called the *want* of sufficient reason; and even this term may appear inaccurate, for it should be the want of *any possible amount* of reason. Since however all that takes place must have a sufficient reason (whether we know it or not) for its happening, and everything which is asserted must be capable, if true, of being shown to have a sufficient reason, there is no objection to our using the words 'want of sufficient reason' in the sense of absolute want of reason, in all matters connected with the exact

sciences. If A be equal to B, there must not only be reason, but reason enough for it; anything short of reason enough is no reason at all, and anything short of proof enough is no proof at all.

The use of the word reason in the statement of this principle may itself be fairly objected to. We are in the habit of speaking of mathematical consequences in the same manner as of those to which the notion of cause and effect applies. When one proposition is made to subserve the proof of another, we call the first one of the reasons of the second, just as we should say that the reason of a flood was the preceding heavy rain. But this mode of speaking must be objectionable if the word reason be used in the same sense in both places. For, first, we are at liberty to deny the effect on denying that cause; if the rain had not fallen, the flood would not have taken place. But when we say that one mathematical proposition is the reason of another, in what position do we stand if we make an hypothetical denial of the first? Simply in that of persons who assert a contradiction of terms, and try to make rational consequences. Thus, the equality of the angles at the base of an isosceles triangle is one of the reasons (so called) why the tangent of a circle is at right angles to the radius. Rationally, the first is one of the simpler propositions, the necessity of which, when seen, helps us to see the necessity of the second and more complicated one. But the necessity of the first is not previous to that of the second, except in the order of our perceptions, when we follow Euclid. Suppose we were to ask, if the angles at the base of the isosceles triangle had not been equal, what effect would that circumstance have had upon the position of the tangent of a circle? We might as well inquire, what would our geometry have been if two straight lines had been capable of enclosing a space?

Secondly, the term reason, in the sense of previous cause, is wrong as applied to mathematical propositions, because when any one is made to prove the second, it generally happens that the second, when granted, may be made to prove the first. Now it is absurd to say that of two things each is the previous cause of the other. The whole of this confusion may be remedied by any one who will remember that one proposition is not the cause of another, but it is our perception of the one which is made the instrument of bringing about our perception of the other. To say that B is the consequence of A is only to say that our knowledge of the truth of B is the consequence of our knowledge of that of A.

Taking care to use the word reason in the sense just alluded to, we assume that whatever is necessary has a possibility of being shown to be necessary, and that whatever is true has a possibility of being shown to be true. If this be a legitimate assumption, it then follows that whatever it is impossible to show to be true, must be false. But can there be such a thing as a proposition of which there shall be seen not its falsehood, but the impossibility of demonstrating its truth? Can there arise a case in which we shall be so completely cognisant of all that may possibly be said for or against an assertion, as to affirm a necessary incapability of demonstration of one side or the other? Such cases are universally admitted by mathematicians to exist; and the final assertion which is made on the known impossibility of proving a contradiction, is said to be made on the principle of the *want of sufficient reason*. In the isosceles triangle, there is a want of sufficient reason, that is, a want of any possible reason, why the angles at the base should be unequal, which might be, were it needful, safely allowed to introduce the assumption of their equality. In statics, when two equal weights are placed on a straight lever, at equal distances from the fulcrum, there is a want of sufficient reason, or a want of any imaginable reason, why either of them should descend rather than the other; and this, in the original system of Archimedes, is the ground of the assumption that they will balance one another.

SUFFIX. [AFFIX.]

SUFFIX, a term lately employed in mathematical language to denote the indices which are written under letters, as in a_0, a_1, a_2, a_3, &c. Though these signs have been so long used, no distinctive name was given to them before the publication of Professor Hall's Differential Calculus.

SUFFOLK, a maritime county of England, is bounded N. by Norfolk, E. by the North Sea, S. by Essex, and W. by Cambridgeshire. The greatest length E. to W. is about 60 miles; the greatest breadth N. to S. is about 40 miles. The area is 1515 square miles. The population in 1841 was 315,073.

Surface; Coast Line; Geology.—The surface of this county is gently undulating, except just along the north-western and some parts of the north-eastern border, where the land subsides into a marshy flat, secured from overflow only by embanking the course of the rivers. There are also some marshes bordering the rivers in the south-eastern part, but none of these are of any extent. There is not an eminence in the county worthy of notice.

The coast has a tolerably regular outline, convex to the sea. The bays are shallow, and the headlands have little prominence. The chief headlands are the point on which Landguard Fort is placed, at the entrance of the æstuary of the Orwell and the Stour, and Lowestoffe Ness, the most easterly point in Great Britain. The harbours are the æstuaries of the rivers Stour and Orwell, Deben, Alde, Blyth, and Yare, and the artificial cut through lake Lothing into the Waveney. The æstuary of the Stour and the Orwell is for the most part lined with marshes, which however do not generally extend more than a quarter of a mile inland from the banks of those rivers. The shore from Landguard Fort to Yarmouth is mostly flat, but there are low cliffs on each side of the æstuary of the Deben, and on the south side of Dunwich; and from Southwold, with two or three short intervals, in which the shore is low, a line of cliffs, consisting for the most part of sand or chalk rubble covering gravel and red loam, extends to the mouth of the Yare. The whole length of the coast may be estimated at above 50 miles.

The greater part of the county is covered by

diluvial beds. The exceptions are the Crag and London Clay district of the S. E., and the Chalk district of the N. W. The Crag and London Clay district extends from Orford by Woodbridge and Ipswich to the banks of the Stour, between Sudbury and Nayland. The Chalk extends N. W. and W. by S. from Bury-St.-Edmunds. The Crag formation consists chiefly of thin layers of quartzose sand and comminuted shells, resting sometimes on Chalk, sometimes on the London Clay.

Suffolk produces scarcely any minerals of value. Chalk and Shell-Marl from the crag formation are dug for manures.

Rivers.—The Waveney and the Little Ouse, border rivers, which separate this county from Norfolk, are noticed under Norfolk. The tributaries of the Waveney are all small. In that part of the county which is adjacent to the lower part of the course of the Waveney are several small sheets of water, as Oulton Broad and Lake Lothing, through which the navigable cut passes into the Waveney, and thence into the Yare. Breydon Water, above 3 miles long and 1 mile wide, is just below the junction of the Waveney and the Yare, on the border of the county. The Lark, a tributary of the Greater Ouse, rises about 6 miles S. of Bury-St.-Edmunds, flows N. to that town, and then N.W. by Mildenhall, to the border of the county, which it skirts for a few miles, and then enters Cambridgeshire, where it joins the Greater Ouse. Its whole length may be estimated at about 30 miles. It is navigable from Bury, and serves to convey produce from that town and neighbourhood to the river Ouse and the port of Lynn.

Of the streams which drain the southern part of the county, the Stour is the most important. It divides Suffolk from Essex, and is noticed under Essex. The Stour receives many tributaries, none of which are navigable. The Orwell, or Gipping as it is called in the upper part of its course, is formed by the junction of several streams, which unite just by Stowmarket. It flows thence S.E. by Needham-Market to Ipswich. Below that town it expands into an æstuary of considerable width, which unites at Harwich with the æstuary of the Stour. It is the æstuary alone which bears the name of Orwell. The course of this river to Ipswich is above 20 miles, for more than half of which (from Stowmarket) it is navigable: the æstuary is 10 or 12 miles long, and for the greater part of that distance more than half a mile wide at high-water. Ships of considerable burden get up to Ipswich. The Deben rises near Debenham, and flows about 20 miles in a winding course to Woodbridge, below which it becomes an æstuary 9 or 10 miles long, and from a quarter to half a mile wide, navigable for sea-borne vessels of considerable burden. The Alde rises near the village of Brundish, and runs 11 miles S.E. to its junction with the Ore, which rises near Framlingham, and has a course E. of about 12 miles. From the junction of the united stream, which is sometimes called Ore, sometimes Alde, it flows about 15 miles into the sea. The course of this part of the river is, for the greater part of its length, an æstuary, which approaches within 200 yards of the sea, and then turning suddenly it flows parallel to the sea, from which it is separated by a narrow and marshy tract of land. The principal feeder of the Alde is the Butley, a small river, the lower part of which becomes a tolerably wide æstuary, opening into the æstuary of the Alde just before it joins the sea. The Alde is navigable to Snape Bridge, near the head of the tideway. The part below the junction of the Butley is sometimes called Butley. The Blyth rises near Laxfield, and flows E. 16 miles to the sea near Southwold: it is navigable up to Halesworth, 8 or 9 miles.

Railways. — The Eastern Counties Railway passes by Ipswich to Bury-St.-Edmunds, and the Ipswich and Norwich Railway is connected with it near Stowmarket.

Agriculture.—Suffolk, with the adjoining counties of Norfolk and Essex, forms one of the best-cultivated districts in the southern part of Great Britain. The climate is much drier than that of the more western counties of England; but also colder in spring, when the north-easterly winds prevail. The soil, although varying extremely, may be divided into three or four distinct kinds. A very rich loam, chiefly alluvial, is found in a small portion of the southern part of the county, between the Orwell and the Stour. This loam is not so compact as clay, nor so loose as sand, but contains a great proportion of organic matter, or whatever else constitutes a very fertile soil. Of this kind of soil it is supposed that there may be about 46,000 acres. The next class consists of heavier loams, varying in every degree, but in general resting on an impervious soil of marl or clay, and in most situations requiring the assistance of drains to carry off superfluous water. This soil is found in the whole of the centre of the county, from the Stour to the borders of Norfolk, and is computed at 450,000 acres, being nearly half the surface of the whole county. Between the strong loam and the sea is a strip running from the north bank of the river Orwell to Yarmouth, diminishing in breadth as it stretches northward, and consisting chiefly of sand of various qualities, incumbent on a subsoil of crag, which is a loose rocky substance, composed of sand, gravel, and broken shells, partly consolidated into a kind of stone. Some of this sand is poor, but a great part of it is enriched by organic matter intimately mixed with it, and this is excellent for roots, especially carrots, and bears very fine barley. In the portions which lie low, and which have at some time or other been covered with water, a very rich mud has been deposited, and has produced as rich a soil as may be desired. These rich portions however are few in comparison to the whole tract, which altogether contains about 150,000 acres. There is another tract of sand of a much inferior quality on the western extremity of the county, extending from Bury-St.-Edmunds to Thetford, with some better lands interspersed. This lies chiefly on a chalk bottom, and is scarcely thought worth cultivating. Where it has been improved, so as to become productive, it has been done at a very considerable expense in draining, trenching, and marling. There may be in this district about 100,000 acres of this poor sand, with

10,000 of a better quality. The last class consists of the fen-lands, which, when properly drained, become valuable; but in their natural state, soaked in water, they are of little value. The extent of fen is estimated at 30,000 acres.

The system of tillage is very uniform throughout the county. The greater part of the land is under the plough. There is now scarcely such a thing to be seen as a common field. The practice of ploughing the stubble immediately after harvest, and giving it the full benefit of the alternations of rain and frost which mark the variable climate of Great Britain, is adopted on all kinds of soil. Wherever turnips can be profitably raised, and safely fed off with sheep, they form the basis of all rotations. Where the land is too strong and adhesive for turnips, and where sheep would do harm by their treading, and where the carts and horses would do equal damage in taking them off, a fallow is substituted. On turnip land the four-course shift, as it is called, is universal, with some deviation as to the recurrence of clover every fourth year, a portion of the land being laid down with grass-seeds, or planted with beans or peas, according to the nature of the soil.

There is no part of England where the implements of husbandry are more perfect than in Suffolk, or where new implements are tried with more readiness and with less prejudice. Nowhere is so great a variety of farm-machines used for saving labour.

The practice of dibbling corn by hand is adopted, as far as the number of hands permit; but on a large farm it is too slow an operation; the drill is therefore generally used, which will in one day sow ten acres of land. Machines for dibbling have been invented, but they have not yet been generally adopted.

Suffolk has but one breed of cattle which is peculiar to it. It is a polled breed, of which the cows are in great repute, and justly so. The cows are usually of a light red, sometimes spotted with white, of moderate size, and excellent milkers. The Suffolk farm-horses are noted for their docility, steadiness, and unwearied perseverance against a dead pull. Suffolk pigs are perhaps, on the whole, the most profitable breed in England. They are well-shaped, short-legged, mostly white, with short upright ears, and the porkers of this breed are excellent. Suffolk has no indigenous breed of sheep; the Southdown and a cross of this breed with the Leicester and Cotswold are very common.

Divisions and Towns.—Suffolk is divided into 21 hundreds. It is chiefly in the diocese of Norwich, but a portion of it is in that of Ely. It is in the Norfolk Circuit, and the assizes are held in Lent at Ipswich, and in Summer at Bury-St.-Edmunds. For parliamentary purposes it is divided into East Suffolk and West Suffolk, each of which returns 2 members; besides which, the boroughs of Bury-St.-Edmunds, Eye, and Ipswich, return each 2 members: total, 10 members. The borough of Sudbury has been disfranchised since the Reform Act.

The following are the principal towns, with the population of each in 1841:—

Aldborough, a market-town, 25 miles N.E. from Ipswich, is situated on the coast, a short distance from the north bank of the river Alde. Some corn is exported. Population of the parish, 1557.

Beccles, a market-town and municipal borough, 32 miles N.E. by N. from Ipswich, is situated on the east bank of the river Waveney, which is navigable for barges from Yarmouth past Beccles to Bungay. The town is well built, consisting of several streets, with a spacious market-place. The parish church is a fine gothic structure, built in 1369, but the porch and tower are of later date. The town contains a town-hall, a gaol, an assembly-room, a theatre, a free-school for writing and arithmetic, and a free grammar-school. Population of the parish, 4086.

Brandon, a village, formerly a market-town, 17 miles N.N.W. from Bury-St.-Edmunds through Thetford, stands on the south bank of the Little Ouse, over which there is a neat stone bridge leading into Norfolk. The town consists of three streets, mostly of well-built houses. Some trade is carried on in corn, malt, coals, and timber, by means of the river, which is navigable for boats. Population of the parish, 2002.

Bungay, a market-town, 31 miles N.N.E. from Ipswich, is enclosed by the Waveney, except on the S.E., the river here flowing in the form of a horse-shoe. The town was nearly destroyed by a fire in 1688, and is consequently comparatively modern. There are some remains of Bungay Castle and of a Benedictine monastery. A considerable trade is carried on in grain and other articles of provision by means of the Waveney, which is navigable up to Bungay for small barges. The town is divided into two parishes. Population of Holy Trinity parish, 1861; of St. Mary, 2248: total, 4109.

Bury-St.-Edmunds. [Bury-St.-Edmunds.]

Clare, a market-town, 16 miles S.S.W. from Bury, is situated on the north bank of the Stour. The church, which is in the centre of the town, is a fine large building. There are vestiges of a castle, which appears to have comprehended an area of about twenty acres, and there are some remains of a priory. Population of the town, 1550.

Debenham, a market-town, 13 miles N. from Ipswich, stands on the west bank of the Deben, here a mere brook. From its situation on a declivity, the town is clean, but the houses are generally mean. The church is a handsome edifice, and there is a tolerably good market-house. Population of the parish, 1667.

Dunwich, a village, formerly a parliamentary borough, 28 miles N.E. by N. from Ipswich, is situated on the coast. It was a place of importance in Anglo-Saxon times, but the sea appears to have advanced upon it, and to have spoiled the harbour and destroyed part of the town. It had formerly 7 parish churches, of which only one remained some years ago, in a ruinous state, and was replaced by a new one built by subscription. Dunwich is now a very small place. Population, 528.

Eye, a municipal borough and parliamentary borough, 20 miles N. from Ipswich. stands on a

small affluent of the Waveney. The streets are irregularly laid out and narrow, and the houses mean. The church is handsome and spacious, with a fine tower of perpendicular character. The municipal borough is governed by 4 aldermen and 12 councillors: population, 2493. The parliamentary borough returns 2 members: population, 7347.

Framlingham, a market-town, 18 miles N.N.E. from Ipswich, stands near the head of the river Ore, which just to the north of the town expands into an extensive pond or mere. The streets are irregularly laid out, but there is a spacious market-place, and the houses are many of them well built. The church is large and handsome, built of black flint, with a tower 96 feet high, in which is a peal of eight bells. On the north side of the town, adjacent to the mere, are the ruins of Framlingham Castle. The outer wall is yet standing. It is 44 feet high and 8 feet thick, and there are 13 towers, which rise to the height of 58 feet. The principal gateway is adorned with the arms of the principal families which have possessed the castle, carved in stone. Population of the parish, 2503.

Hadleigh, a market-town, 9 miles W. by S. from Ipswich, consists of one principal street, and other smaller ones branching from it. The church is large and handsome, with a tower and spire and two south porches. The architecture is chiefly of perpendicular date, but some portions are earlier. Population of the parish, 3679.

Halesworth, a market-town, 31 miles N.N.E. from Ipswich, through Woodbridge and Saxmundham, stands on a small stream which joins the river Blyth half a mile to the S.E. The streets are wide, but without foot-pavements. The church is a handsome gothic building. The Blyth and its branch are made navigable up to the town, and afford facility for the export of agricultural produce, and the import of coal, lime, and general merchandise. Population of the parish, 2662.

Haverhill, a village, formerly a market-town, 16 miles S.W. from Bury-St.-Edmunds, consists of one principal street on the road from Cambridge to Colchester. The church is a large ancient building. Population of the parish, part of which extends into Essex, 2451.

Ipswich, a municipal borough, parliamentary borough, and the county-town of Suffolk, 68 miles N.E. from London by the Eastern Counties Railway, is situated on the side of a hill near the junction of the rivers Orwell and Gipping. The town existed in the Saxon times. The streets, though well paved and lighted with gas, are narrow and irregular, which is attributable to the circumstance that the town is not known ever to have suffered from fire. There are many good buildings, and many extremely old, decorated with curiously-carved images. Most of the houses, even in the heart of the town, have convenient gardens adjoining them, which render it at once agreeable, airy, and salubrious. The water for the supply of the town rises from springs in the neighbourhood, and is conveyed into the town by pipes. The manufactures of the town consist chiefly in the spinning of woollen yarn, ship-building, sail-making, &c. Its commerce arises from the exportation of corn, malt, and other produce of the surrounding country. There is a harbour for light vessels formed by the æstuary of the Orwell, which is navigable at high-water up to the bridge, except for vessels of large burthen, which lie at Downham Reach. The principal public buildings are the churches of Saints Clement, Helen, Laurence, Margaret, Mary at Elms, Mary at Kay, Mary at Stoke, Mary at Tower, Matthew, Nicholas, Peter, and Stephen. To the northward of the church of St. Mary at Kay was formerly a house of Black Friars, called the Priory of St. Peter's. The extensive site of this convent was purchased by the corporation, and confirmed to them in 1572 by the appellation of Christ's Hospital. Part of this edifice is now occupied as an hospital for poor boys, in which they are maintained, clothed, and educated. In the spacious refectory of the same building is now held the Free Grammar School. In 1524 Cardinal Wolsey having intimated to the university of Oxford his design of founding a college (now Christ Church), the priory of St. Peter's was surrendered to him in 1527, whereon he founded a school as a nursery for his intended college at Oxford, and this school is said for a time to have rivalled those of Eton and Winchester. Queen Elizabeth granted two charters for the regulation of the Grammar School and of Christ's Hospital. The municipal borough is divided into 5 wards, and is governed by 10 aldermen (of whom one is mayor) and 30 councillors: population, 25,384. The parliamentary borough returns 2 members: population, 24,660.

Ixworth, a village, formerly a market-town, 7 miles N.E. from Bury-St.-Edmunds, consists of one main street and two or three smaller streets. Population of the parish, 1064.

Lavenham, a market-town, 10 miles S. by E. from Bury-St.-Edmunds, stands on the declivity of a hill, at the foot of which flows the little river Bret. It is irregularly laid out, and the houses are mean. The market-place is spacious, and there is a stone cross in the centre. There is a bridewell in the town. The church is large and handsome, with a lofty tower; the architecture is perpendicular. Population of the parish, 1871.

Lowestoft, a market-town, 45 miles N.E. from Ipswich, stands on the top of a cliff facing the sea, from which it is separated by a beach, in some parts nearly half a mile wide. It consists of one principal well-paved street, nearly a mile long, lined with good modern brick houses, and of some smaller streets opening into this on the west side. The houses on the east side of the High Street have gardens at the back sloping down the face of the cliff towards the sea. Buildings have accumulated at the bottom of the cliff on the beach, where the curing-houses for herrings are situated. The parish church is a large and handsome building of perpendicular architecture, situated nearly half a mile west of the town. It has a tower and spire 120 feet high, 50 feet of which belong to the spire. There is a chapel-of-ease in the town. The town has a town-hall or chamber

over the market-cross, and a small theatre. On the cliff is the upper lighthouse, and on the beach a battery and the lower lighthouse. Population of the parish, 4647.

Mendlesham, a village, formerly a market-town, 15 miles N.N.W. from Ipswich, consists of mean houses, but has a handsome church. Population of the parish, 1340.

Mildenhall, a market-town, 12 miles N.W. from Bury-St.-Edmunds, stands just on the border of the fen country, which stretches into Norfolk and Cambridgeshire. It is irregularly laid out, and the streets are neither paved nor lighted, but the houses are for the most part well built. The church is large and handsome, with a tower 120 feet high. The river Lark, which passes close to the south side of the town, is navigable, and facilitates the export of corn and agricultural produce, in which considerable business is done. Population of the parish, including the hamlets of Beck-Row, Holywell-Row, High-Town, and West-Row, 3731.

Needham-Market, a village, formerly a market-town, 8 miles N.W. by N. from Ipswich, stands on the S.W. bank of the Gipping, which is navigable for boats. The village consists of one main street and some smaller ones. The houses are neat, and some of them handsome. There is a free grammar-school. Population of the parish of Barking, in which the village is a chapelry, 1353.

Newmarket, a market-town, 13 miles W. from Bury-St.-Edmunds, has a small part of the town and the race-course in Cambridgeshire. The main street is long and wide and well lighted. The houses for the most part are modern and well built. The greater part of the town was destroyed by fire in 1623, and again in the early part of the last century. Horse-racing does not appear to have been introduced here till about the close of the 16th century. Soon after the accession of James I. to the English throne horse-racing became a fashionable diversion, and a house was erected at Newmarket for the accommodation of him and his court. The race-course is on the western side of the town. It extends four miles in length, and is considered one of the finest in the world. The prosperity of the place is mainly dependent upon the company which the races never fail to attract, and the training of horses, many of which are exported or otherwise disposed of at high prices. The training-ground is on a gentle acclivity on the southern side of the town, and for its purpose is even superior to the race-course, preference being given to it for training horses destined to run in the most distant parts of England. Newmarket consists of two parishes—St. Mary's, in Suffolk (population, 2143), and All Saints, in Cambridgeshire (population, 813): total population, 2956.

Neyland, or *Nayland*, a village, formerly a market town, 14 miles S.W. by W. from Ipswich, stands in a low situation on the north bank of the Stour, over which there is a bridge. The village contains some good houses and some flour-mills. Corn and flour are sent down the Stour to be conveyed to London. Population of the parish, 1114.

Orford, a village, formerly a market-town, 20 miles W.N.W. from Ipswich, consists of ill-built houses irregularly laid out on the N.W. bank of the Alde, which is navigable. The chapel, when entire, was a large building: the nave alone is now used, and is separated by a wall at the east end of it from the chancel, which is more ancient, and has been allowed to fall to ruin. There are some curious portions in the nave. The ruins of the chancel are of Norman architecture. Only the keep of Orford Castle remains: it is a polygon of 18 sides, with walls 90 feet high, and has three square towers in its circuit, which overtop the rest of the building. The architecture is Norman. The chapelry of Orford is in the parish of Sudbourne. Population of the parish, 1014.

Saxmundham, a market-town, 20 miles N.E. from Ipswich, consists chiefly of one long narrow street, lined with neat and respectable-looking houses. It is in a valley, through which, at the back of the houses, on the east side of the street, runs a small brook, a feeder of the Alde, which it joins about four or five miles south of the town. The church is a neat building just out of the town. Some business is done in malting and in shipping corn for London from the wharfs on the river Alde. Population of the parish, 1097.

Southwold, a market-town and municipal borough, 36 miles N.E. by N. from Ipswich, is situated on a hill, forming a cliff toward the sea, and sinking on the other side into the marshes through which the river Blyth, and an arm of it called the Buss Creek, flow. By these waters the hill on which the town stands is almost insulated. The only entrance to the town is on the N.W., by a bridge over the Buss Creek; and the main street is on the road from this bridge to the face of the cliff: it has flagged footpaths, and is lined near the sea with respectable houses; but in other parts the houses are of inferior character. The church is near the entrance of the town, on the north-west side, and is a large and handsome building of perpendicular architecture, mostly of flint and stone: it has a western tower about 100 feet high, and there are two low hexagonal towers at each angle of the eastern end of the chancel. There is a highly-ornamented porch, of somewhat later date than the church. The town-hall is a modern building, and there is a small gaol. The municipal borough is governed by 4 aldermen and 12 councillors. Population of the parish, 2186.

Stowmarket, a market-town, 12 miles N.W. by N. from Ipswich, consists of one main street along the Bury and Ipswich road, and of some smaller ones. The streets are for the most part paved, and lined with tolerably good houses; several of the houses are very good, and the town is lighted with gas. The church is spacious and handsome, built of flint and stone: the architecture is partly decorated, partly perpendicular. The Gipping has been made navigable up to the town, and a considerable quantity of corn and malt are sent in river-craft down to Ipswich to be shipped there: timber and deals, coals and slate, are brought up from Ipswich for the supply of the neighbourhood. The bank of the river forms an agreeable walk. Population of the town, 3043.

Sudbury, a market-town and municipal borough,

16 miles S. from Bury-St.-Edmunds, was constituted a parliamentary borough by the Reform Act, but has since been disfranchised. Sudbury existed in Saxon times, and was afterwards a place of importance. The town consists of several streets, irregularly laid out. It is a neat, clean, well-built place. The streets are paved, with flagged footpaths, and lighted. Many new houses have been built, and the town has been altogether much improved of late years. Ballingdon has one street, forming a suburb of Sudbury, with which it is united by a bridge over the Stour, which flows past the town on the western side. The three churches are mostly of perpendicular character: they have all been fine churches, but some of the tracery and other parts have been much mutilated. The town-hall is a modern building, and there is a neat theatre. The principal manufacture is of silk. By means of the Stour, which is navigable nearly up to the town for barges, trade is carried on in coals, which are imported, and in agricultural produce, which is exported. The navigation however is bad. The municipal borough is governed by 4 aldermen and 12 councillors: population, 5082.

Woodbridge, a market-town, 7 miles E.N.E. from Ipswich, stands on the N.W. bank of the æstuary of the Deben, which, at high-water, is a quarter of a mile wide: it consists of two principal streets (one of them near a mile long), which contain many good houses and are well paved, and of several smaller streets and lanes. The market-place is spacious, and surrounded with well-built houses: in the centre of it is an ancient shire or sessions hall, in which quarter-sessions for the division are held: the lower part of the hall is the corn-market. The church is large and handsome, built chiefly of black flint: it has a large square tower, built of flint and stone, 180 feet high: toward the top the flint and stone are so intermingled as to form various devices. The town contains a custom-house, a small theatre, and barracks, and near the town is a bridewell. Woodbridge is a place of considerable trade: it is a port, and the river Deben is navigable for small coasting vessels: the tide flows above the town. Corn, malt, and flour are exported; and coal, timber, and general merchandise imported. There are two good quays on the bank. Population of the parish, 4954.

History and Antiquities.—Suffolk appears to have been comprehended with Norfolk in the territories of the Simeni (Σιμενοι) of Ptolemæus, called by others the Iceni. It was included in the Roman province of Flavia Cæsariensis. There were several British and Roman towns in this county. The river Waveney and its valley appear, in the British and Roman periods, to have been one of the branches of a great æstuary which penetrated deeply inland on this side of the island. The æstuary penetrated at least as far as Bungay: it probably extended higher up, for traces of ancient navigation have been noticed as far up as Eye. Several lines of Roman roads extended through the county, such as the Peddar-Way, the Icknield-Street, and others.

Roman antiquities have been found at Burgh Castle, near Breydon Water, where the greater part of the walls of a Roman encampment are yet standing; at Blythburgh; at Bury; at Dunwich; at Eye; at Haughley, near Stowmarket, where a Norman castle was erected on the site of a Roman camp; at Icklingham, near Mildenhall; at Ickworth, near Bury; at Ixning or Exning, near Newmarket; at Ixworth; at Pakenham, near Ixworth; at Stow Langtoft, in the same neighbourhood, where are the remains of a camp; at Felixstow, near the mouth of the Deben; and at Wenham, near Stratford.

Suffolk was probably settled by a body of Angles independent of those who occupied Norfolk. The names of South Folk and North Folk describe the relative position of these two bodies. In the civil war of Stephen and Henry of Anjou, afterwards Henry II., Ipswich, which was held by Hugh Bigod for Henry, was taken by Stephen (1153).

In the middle ages Suffolk appears to have abounded with religious establishments. Tanner ('Notitia Monastica') enumerates fifty abbeys, priories, hospitals, or colleges. Only three however of the greater monasteries, or those with 200*l.* clear yearly revenue, were in the county,—the abbeys of St.-Edmunds-Bury, Sibton, and Butley. Of Butley Abbey, between Woodbridge and Orford, the gate-house is the principal remain: it is incorporated in a modern mansion: there are some other remains of the abbey, but of less moment. Of Sibton Abbey, which is near Yoxford, on the road from Ipswich to Yarmouth, there are extensive remains. Of castellated remains the most remarkable are Framlingham, Orford, Clare, Bungay, Mettingham, and Wingfield. Of old mansion-houses, with which the county abounds, Flixton Hall, near Bungay; Giffard's Hall, at Stoke by Neyland, on the Stour; Helmingham Hall, near Debenham; Hengrave Hall, N.W. of Bury; Kentwell Hall and Melford Hall, near Sudbury; and Parham Hall, near Framlingham, may be mentioned.

SUFFRAGAN. [BISHOP.]

SUGAR is a sweet crystallised substance, most commonly prepared from the expressed juice of the sugar-cane, of which there are several species [SACCHARUM]; but sometimes from beet-root [BEET], from the sap of one or more species of maple [ACER], and from other vegetable productions.

History. — Some of the Greek and Roman writers previous to the Christian æra mention sugar as a substance obtained from canes in India and Arabia; but it does not appear to have been introduced into Europe for domestic use till after the Crusaders had become acquainted with it in northern Africa and Syria. It is probable that the Moors and the Crusaders were the chief means of the culture of the sugar-cane being extended to Europe. About the year 1420 the Portuguese introduced the sugar-cane from Sicily into Madeira, and during the 15th century it was carried from Spain to the Canaries. Its further extension to America and the West Indies was a natural result of the discovery and settlement of the continent and islands of the western hemisphere.

Whatever may have been the precise period of the commencement of the English sugar-manufacture in Barbadoes, Anderson ('History of Commerce') states that in 1627, and for several years later, the Portuguese supplied most parts of Europe with Brazil sugars. About 1650 the British planters in Barbadoes appear to have been realising property very rapidly by the manufacture of sugar, they having obtained, a few years before, valuable information from Brazil respecting the culture and process of extracting it from the cane. The cultivation spread from one colony and island to another; until all of those which have a climate fitted for it have since more or less engaged in this branch of industry.

Culture.—The height attained by the canes, their colour, the length of their joints, and many other particulars, vary with different species, with the character of the soil, and with the modes of culture adopted. The stems vary in height from eight feet up even to twenty feet, and are divided by prominent annular joints into short lengths. Long narrow leaves sprout from each joint; but as the canes approach maturity, all those from the lower joints fall off. The outer part of the cane is hard and brittle, but the inner consists of a soft pith, which contains the sweet juice, and this juice is elaborated separately in each joint. The canes are usually propagated by slips or cuttings, consisting of the top of the cane, with two or three of the upper joints, the leaves being stripped off. These are planted either in holes dug by hand, or in trenches formed by a plough, about eight to twelve inches deep; the earth being banked up upon the margin, and well manured. When the plough is used, it is returned along the furrow, so that the earth may be thrown up on each side of the trench. Two or more slips are laid longitudinally at the bottom of each hole, and covered with earth from the banks, to the depth of one or two inches. In about a fortnight the sprouts appear a little above the earth, and then a little more earth from the bank is put into the hole; and as the plants continue to grow the earth is occasionally filled in, by little at a time, until, after four or five months, the holes are entirely filled up. The planting usually takes place from August to November, and the cutting in March or April. The maturity of the cane is indicated by the skin becoming dry, smooth, and brittle; by the cane becoming heavy; the pith gray, approaching to brown; and the juice sweet and glutinous. The canes which grow immediately from the planted slips are called *plant-canes;* but it is usual, in the West Indies, to raise several crops in successive years from the same roots; the canes which sprout up from the old roots, or *stoles,* being called *rattoons.* The rattoons are not so vigorous as the original plant-canes; but they afford better sugar, and that with less trouble in clarifying and concentrating the juice. The old practice of the West Indian colonists was to plant one-third of the cane-grounds every year, so as to obtain one crop from plant-canes and two from rattoons; but latterly more dependance has been placed upon rattoons. Some planters have, under favourable circumstances, raised rattoon crops for more than twenty years successively, from the same stoles. The canes should be cut as near the ground as possible, because the richest juice is found in the lower joints; and, after cutting them, it is considered well to cut the stumps down a few inches below the surface of the ground, and to cover them up with mould. One or two of the top joints of the cane are cut off, and the remainder is divided into pieces about a yard long, tied up in bundles, and carried immediately to the mill. The upper branches of the cane are used as food for cattle, and the remainder of the waste forms a valuable manure, for which purpose the *trash,* or waste from the mill, is admirably suited, though much of it is usually consumed as fuel.

Manufacture.—The operation of cutting the canes is so adjusted as to keep pace with the action of the mill by which the juice is to be pressed out; so that the canes may be crushed or ground while quite fresh. In the East Indies mills of very rude and imperfect construction are used. Some of them resemble mortars, formed of the lower part of the trunks of trees, in which the canes are crushed by the rolling motion of a pestle, which rests in an inclined position against the side of the mortar, and is moved by oxen yoked to an horizontal bar connected with it. The common vertical cane-mills of the West Indies consist of three rollers, mostly of wood, with narrow strips of iron attached to their faces, so as to form, by the spaces left between them, straight grooves extending from end to end of the rollers. These are usually from twenty to twenty-five inches in diameter, and about forty inches long; and they are placed side by side in a strong frame, with contrivances for varying, in a slight degree, their distances from each other. The moving-power, which may be horses, wind, water, or steam, is applied to the middle roller, and communicated from it to the others by cogged wheels. In using the mill, a negro applies the canes in a regular layer or sheet to the interval between the first and second rollers, which seize and compress them violently as they pass between them. The ends of the canes are then turned, either by another negro on the opposite side to the feeder, or by a framework of wood called a *dumb returner,* so that they may pass back again between the second and third rollers. As these are placed nearer together than the first and second, they compress the canes still more, so that on leaving them they are reduced to the form of dry splinters, which are called *cane-trash,* and are used as fuel in heating the vessels for evaporating the juice. Channels are made to receive the liquor expressed from the canes, and to conduct it to the vessels in which it is to undergo the succeeding operations.

The construction of this mill is very defective, since it is impossible to supply the canes to the rollers in so uniform a layer as to prevent them crossing each other. They become therefore unnecessarily crushed and broken, so that the liquor is rendered foul, and the rollers are exposed to irregular and destructive wear. These evils are obviated by the improvement of placing the rollers in a horizontal position, and feeding the mill by

sliding the canes gradually from an inclined board. The rollers are made very accurately of cast-iron, hollow, and fluted or grooved on the surface. Many varieties of improved sugar-mills have been brought successfully into use.

Cane-juice, as expressed by the mill, is an opaque slightly-viscid fluid, of a dull gray, olive, or olive-green colour, of a sweet balmy taste, and of a specific gravity varying from 1.033 to 1.106. It holds in suspension particles of solid matter from the cane, a considerable portion of which are separable by filtration or repose. The juice is so exceedingly fermentable that in the climate of the West Indies it would often run into the acetous fermentation in twenty minutes after leaving the mill, if the process of clarifying were not immediately commenced.

The processes followed in the East Indies for separating the sugar from the cane-juice are very tedious and imperfect. The method practised in the West Indies is as follows. The juice is conducted by channels from the mill to large flat-bottomed coppers or open pans, called *clarifiers*, which contain from three hundred to a thousand gallons each. Each of these clarifiers is placed over a fire, which may be regulated or extinguished by a damper; and each is supplied with a stop-cock or siphon for drawing off the liquor. When the clarifier is filled with juice, a little slaked lime is added to it; the lime, which is called *temper*, being, in most cases, previously mixed with a little cane-juice to the consistence of cream. As the liquor in the clarifier becomes hot, the solid portions of the cane-juice coagulate, and are thrown up in the form of scum. The damper is then closed, and the fire dies out; and after an hour's repose, the liquor is ready for removal to the first of the evaporating pans. The clarified juice, which is bright, clear, and of a yellow wine-colour, is transferred to the largest of a series of evaporating coppers, or pans, three or more in number, in which it is reduced in bulk by boiling. These evaporators are placed over a long flue, heated by a fire at one end, over which the smallest of the coppers, called the *teache*, is placed. In the process of boiling, impurities are thrown up in the form of scum, which is carefully removed; and lime-water is sometimes added. In the teache the liquor is boiled down to as thick a consistency as is considered necessary for granulation. The concentrated syrup is laded, or *skipped*, from the teache, either immediately into open wooden boxes called *coolers*, or into a large cylindrical cooler, about six feet wide and two deep, from which it is afterwards transferred to the smaller coolers, or rather crystallising or granulating vessels. The sugar is brought to the state of a soft mass of crystals, imbedded in molasses, a thick, viscid, and uncrystallisable fluid. The separation of this fluid is the next part of the process, and is performed in a building called the *curing-house*. This is a large building, the floor of which is excavated to form the molasses' reservoir, which is lined with sheet-lead, boards, or cement. Over this cistern is an open framing of joists, upon which stand a number of empty casks, or sugar-hogsheads, called *potting-casks*, Each of these has eight or ten holes bored through the lower end, and in each hole is placed the stalk of a plantain-leaf, which is long enough to descend a few inches below the level of the joists, and to rise above the top of the cask. The soft concrete sugar is removed from the coolers into these casks, in which the molasses gradually drain from the crystalline portion, percolating through the spongy plantain-stalks, which act as so many drains to convey the liquid to the cistern beneath. With sugar of average quality three or four weeks is sufficient for this purpose.

When it leaves the curing-house the sugar is packed in hogsheads for shipment as *Raw, Brown*, or *Muscovado Sugar;* and in this state it is commonly exported from our West Indian colonies. The sugar loses usually about 12 per cent. in weight by the drainage of the remaining molasses from it while on ship-board.

Refining.—Clayed Sugar, also called *Lisbon Sugar*, is raw sugar that has been subjected to a certain degree of refining. The sugar is removed from the coolers into conical earthern moulds called *formes*, each of which has a small hole at the apex. These holes being stopped up, the formes are placed, apex downwards, in other earthern vessels. The syrup, after being stirred round, is left for from fifteen to twenty hours to crystallise. The plugs are then withdrawn, to let out the uncrystallised syrup; and, the base of the crystallised loaf being removed, the forme is filled up with pulverised white sugar. This is well pressed down, and then a quantity of clay, mixed with water is placed upon the sugar, the formes being put into fresh empty pots. The moisture from the clay, filtering through the sugar, carries with it a portion of the colouring matter, which is more soluble than the crystals themselves. By a repetition of this process the sugar attains nearly a white colour, and is then dried and crushed for sale. Mr. Hague's patent process consists in whitening the sugar by forcing the moisture and the colouring matter out of it by the action of a vacuum filter; and there are other processes for whitening the sugar, but the general practice is to bring it to England in the state of raw brown sugar, to be either used in that state, or to be refined into loaf sugar.

The art of refining sugar, as well as that of extracting it from the cane, is supposed to have been brought to Europe from the East, probably from China; but at what time is uncertain. Stow's 'Survey of London' states that sugar-refining was commenced in England about 1544. Few manufacturing operations have undergone of late years more important changes than this; improved chemical mixtures, and the application of a vacuum at a particular stage of the operations, having greatly improved the whole of the arrangements. The present mode of conducting the operations is generally as follows :—

The raw sugar, at the sugar refinery, is transferred from the casks into large circular vessels, called *blow-up cisterns*, in which it is mixed with water, and with a small quantity of lime dissolved in water so as to form a milky fluid. The mass is heated by steam, which is forced by its

own pressure through small apertures in copper pipes, which are laid along the bottom and sides of the vessel; and the perfect solution of the sugar is aided by stirring with long poles or oars. The liquor is allowed to flow from the blow-up cistern to a range of filtering-vessels in a room beneath. The filters are tall vessels six or eight feet high, of cast-iron or wood, having cisterns at top and bottom; and each filter contains about sixty cloth or canvas tubes, closed at their lower ends, but communicating at their upper ends, by which they are suspended, with the upper cistern. Within each of these tubes is a bag of thick close cotton-cloth, which, being much larger in diameter than the tube in which it is enclosed, is necessarily folded together. By this device a very extensive filtering surface is obtained in a small compass; and, as the liquor from the upper cistern cannot escape from the inner bags except by percolating through the meshes of the cloth, it becomes, as it drops into the lower cistern, very clear and transparent; most of the solid impurities remaining in the bags. On leaving the filter, the syrup, though clear and transparent, is of a reddish colour; and the removal of this tinge is effected by filtering the syrup through a mass of powdered charcoal. This charcoal is placed in a large square vessel, which has a perforated false bottom covered with a piece of cloth, upon which the charcoal is laid to the thickness of nearly three feet. The syrup is conducted by pipes from the bag-filter to the surface of the charcoal, through which it percolates slowly; it then drops through the cloth, and through the holes in the perforated bottom, into the cavity beneath, where it is found almost colourless.

In the evaporation or concentration of the clarified syrup, which forms the next part of the refining process, the boiling is effected in a vacuum, at a temperature of about 140° Fahr.; instead of by an open fire, at a temperature of about 240° Fahr., as formerly: this is one of the greatest improvements in the manufacture, and is due to the Hon. E. C. Howard. The vacuum sugar-pan consists of a close copper vessel, the several parts of which are united by flanges, with packing between the joints to render them perfectly air-tight. The middle portion of this vessel is cylindrical, and from six to seven feet in diameter; the upper part is convex or dome-shaped; and the bottom is also convex, but the convexity is less. The bottom of the pan is double, the cavity between the inner and outer bottom forming a receptacle for steam; and there is also a coiled steam-pipe just above the upper bottom. There is one pipe of communication with the vessel of clarified syrup, one with the vessel which is to receive the crystallised sugar, and one with an air-pump; and there are many valves, gauges, and other subsidiary apparatus. In using the pan, a quantity of liquid sugar is admitted; and the air-pump is set to work, to extract all the air from the pan, in order that the contents may boil at a low temperature. The evaporation proceeds; and to enable the person who superintends the process to ascertain when the syrup is sufficiently evaporated, the pan is supplied with a very ingenious appendage called the *proof-stick*, by which a little of the sugar can be taken out, and its state ascertained by the touch.

The evaporated syrup flows out of the pan through a pipe into an open vessel beneath, called the *granulating vessel*, around which steam circulates, and within which the syrup is brought to a partially crystallised state. From the granulators the syrup or sugar is transferred into moulds of a conical form, which were formerly made of coarse pottery, but are now usually of iron. These moulds, like those used in the claying process, have orifices at their points, which are stopped up before they are filled with sugar. They are arranged on the floor in rows, with their open bases uppermost; and immediately after the sugar is poured in it is stirred round, to diffuse the crystals equally through the semifluid mass. They are then left for several hours, that the sugar may become solid: after which they are removed to another room; and their points being unstopped, and the concreted sugar at the apex being pierced by a steel wire, they are set in earthern jars, that the uncrystallised fluid may drain from them; or the same purpose is effected by placing them in racks, with gutters to receive and conduct to a cistern the syrup that flows from the sugar. This syrup is re-boiled with raw sugar, so as to yield an inferior quality of sugar; and when all the crystallisable matter has been extracted from it, the remainder is sold as *treacle*. The loaves of sugar, after a few finishing processes, are ready for sale.

The improvements introduced into the processes of sugar-refining allow loaf sugar to be now sold at a price so little exceeding that of raw sugar, that the manufacture has lately vastly increased.

Sugar-Candy is a kind of crystallised sugar made in China and India. The crystals are formed around small strings or twigs, from which they are afterwards broken off.

Beet-Root Sugar is described in the article BEET. The manufacture is not in a flourishing state, as it cannot well compete commercially with that from the sugar-cane. *Maple Sugar* (noticed under ACER) is obtained by piercing the trunks of the sugar-maple trees, in February or March. The juice trickles out through tubes of elder or sumach into vessels; and in two or three days afterwards it is boiled down to one-third of its original bulk, clarified, filtered, granulated, and sometimes refined.

Chemical and Dietetic Properties.—Cane-sugar is colourless, inodorous, of a purely sweet taste, moderately hard, and brittle. The crystals, when rapidly formed, as in common refined sugar, are small; but when obtained by the slow evaporation of a strong solution, they are of considerable size and prismatic in their form (Sugar-Candy). The specific gravity of sugar is about 1.065: it undergoes no change by exposure to the air; and, when moderately heated, loses only a little hygrometric moisture. It is soluble in one-third of its weight of cold water, and combines with hot water in all proportions: a solution saturated at 230° forms, on cooling, a mass of small crystals. It is soluble in alcohol, but much less so than in water. Sugar

is phosphorescent when two pieces are rubbed together in the dark. When heated to 365° sugar melts into a viscid colourless liquid, which, when cooled suddenly, becomes a transparent mass (Barley-Sugar). By keeping, it becomes opaque; at 400° to 420° sugar is converted into Caramel by losing an equivalent of water. When exposed to a high temperature sugar undergoes decomposition, yielding various gaseous products, and leaving a large proportion of charcoal. The acids produce very different effects upon sugar. Sugar in many cases combines with the alkalies, earths, and metallic oxides, and, in some cases, forms definite compounds with them. Lime, barytes, and oxide of lead dissolve in considerable quantity in a solution of sugar. According to Berzelius, cane-sugar consists of $C^{12} H^{11} O^{11}$; but when it is exposed to a high temperature, it gives off $H^2 O^2$, so that *Caramel*, or anhydrous sugar, consists of $C^{12} H^9 O^9$.

Maple Sugar and *Beet-Root Sugar* have very nearly the same properties and constitution as cane-sugar. *Grape Sugar*, which has less sweetness than the others, is composed of $C^{12} H^{14} O^{14}$. *Manna Sugar* is procured by boiling and evaporating the manna which exudes from several species of ash; it is slightly sweet, but is not fermentable. *Honey Sugar* contains two kinds of sugar, one crystallisable and the other uncrystallisable. *Liquorice Sugar*, or *Glycyrrhizin*, is obtained from liquorice-root. It is a yellow transparent substance, extremely sweet, very soluble both in water and alcohol, and has a great tendency to combine with acids, bases, and salts. *Mushroom Sugar* is obtained from several species of agaricus, &c. It crystallises in square prisms, is colourless, only slightly sweet, and less soluble in water than cane sugar. The sugars obtained from *malt* and from *starch* resemble grape sugar. *Sugar of Milk*, or *Lactine*, is obtained by evaporating the whey of milk to its crystallising point. It forms colourless four-sided prisms, which are soluble in about six parts of cold water and two and a half parts of hot: the taste of this sugar is not very sweet, it is unalterable in the air, and is insoluble in alcohol and æther. *Diabetic Sugar*, obtained from diabetic urine, has the general properties of grape sugar.

Regarded in its physiological or organic relations, sugar is a proximate principle, chiefly of vegetables, but also sparingly of animals of the class Mammalia. It presents considerable varieties, according to the source whence it is obtained, and is distinguished into those which are capable of undergoing the vinous fermentation, and into those which are not; also into those which can assume a definite crystalline form, and those which cannot. It almost invariably exists in a dilute and liquid state in plants, but it occasionally exhibits a crystalline form in the flower of certain plants. Sugar is the great principle by which rapidly-growing succulent parts of plants and seeds, when they germinate, are nourished. Hence it is produced in large quantities in such seeds as contain starch, when excited to germinate, as may be observed in the process of malting, which up to a certain stage is exactly that of the germination of the seed. A similar transformation of starch into sugar takes place in the ripening of many fruits, and in the flowering of many plants. The transformation of starch into gum and sugar is effected by a principle called *diastase*, which is so powerful, that one part of it is sufficient to render soluble the interior portion of two thousand parts of starch, and convert it into sugar. The elements of diastase are developed in the buds. Many seeds, before they are ripe, contain a saccharine substance, which is changed into starch when fully ripe, but which again becomes sugar in germinating. The starch lodged in the stem of certain trees in autumn is converted, by the ascending sap in spring, into sugar, with great rapidity.

Besides the *juice* sugar, there is the *granular* sugar, which forms a constituent of a great many fruits, not merely fleshy, such as pears, cherries, peaches, melons, dates, figs, grapes, on which last two it forms a white incrustation when these are dried, but in chestnuts, when produced in warm regions. It exists in the nectaries of many flowers, and is collected by the bees; hence honey is only one of the kinds of this sugar. Lignin, or anything containing or formed from it, such as saw-dust, linen-rags, or paper, may be transformed into granular sugar. It is likewise the kind of sugar formed during the germination of seeds. The only uncrystallisable sugar which is capable of fermentation is the molasses, which remains after the refining of the cane and other sugars. It is largely employed for the distillation of rum.

In treating of the dietetical properties of sugar, it is necessary to view it in a variety of conditions. In temperate climates sugar is regarded as a luxury, one indeed which is nearly indispensable; but in tropical countries it is a universal article of subsistence, partly as real sugar, and partly, and more generally, as it occurs in the cane, which is either simply chewed or sucked, or softened by previous boiling. In the sugar colonies the ripe sugar-cane is one of the most nutritious substances, and is highly relished by the negroes. The crude plant, or the newly-expressed juice, contains water, sugar, gum, green fecula, extractive, gluten, acetic and malic acids, acetates of lime and potash, supermalate and sulphate of lime, and lignin; by the removal of such of these principles as contain nitrogen, especially the gluten and green fecula, the nutritive power of sugar is sensibly diminished; and thus loaf-sugar is less nutritive than brown sugar.

However harmless the use of saccharine vegetables may be to persons in health, there cannot be a doubt but that in some instances they are extremely hurtful. The blood of a perfectly healthy individual contains no appreciable quantity of sugar; but in diabetes, sugar has been repeatedly ascertained to exist in the sanguiferous system—a fact unequivocally demonstrating that the assimilating organs had failed to convert the saccharine aliment into the constituent principles of the blood. Persons of bilious habit ought likewise to be sparing in the use of sugar.

Sugar, though prone to fermentation when in a dilute state, possesses when concentrated great

antiseptic properties, and is extensively employed to preserve both animal and vegetable substances from decomposition. Sometimes the sugar existing naturally in many fruits is sufficient to ensure their preservation, as in figs, raisins, and other dried fruits; especially if the season has been bright and warm, when more sugar is elaborated. In other cases sugar is added, as in many preserves and jellies. Sugar added to meat, fish, &c., renders less salt necessary for keeping them, and preserves more of the natural taste and flavour. Many medicinal substances, as well as flavours and colouring principles, are preserved by means of sugar.

Sugar Trade. Before the discovery of America, sugar was a costly luxury used only on rare occasions. About 1459 Margaret Paston, writing to her husband, who was a gentleman and landowner of Norfolk, begs that he will 'vouchsafe' to buy her a pound of sugar. The consumption has gradually but steadily increased throughout the world. In 1839 it was estimated that the growth in all the countries of which estimates could be made, amounted to the following quantities :—

Exported.	Cwts.
British sugar colonies	3,571,378
British India	519,126
Danish West Indies	450,000
Dutch ditto	260,060
French sugar colonies	2,160,000
United States of America	900,000
Brazil	2,400,000
Spanish West Indies	4,481,342
Java	892,475
For internal consumption, exclusive of China, India, Siam, Java, and United States	2,446,337
	18,080,718

But these estimates seem too low; it is certain that the quantity now must be much greater.

The duties on the importation of sugar into this country have varied very considerably. Between the years 1661 and 1815 the duty was gradually raised from 1*s.* 6*d.* to 30*s.* per cwt. on British plantation sugar. From 1815 to 1844 it varied from 24*s.* to 30*s.* East India sugar paid a higher duty than West India until 1836, when the two were assimilated. Foreign sugar paid a duty of 60*s.* to 63*s.* per cwt. until the recent legislative changes.

The following quantities of sugar were imported into the United Kingdom, and retained for home consumption, in the year ending Jan. 5, 1848 :—

	Imported. Cwts.	Entered for home consumption. Cwts.
West Indies	3,191,137	2,582,589
East Indies	1,407,383	1,183,563
Mauritius	1,194,047	1,050,086
Foreign	2,403,677	975,545
Refined	82,165	25,284
Candy	1,995	978
Molasses	949,363	638,623
	9,229,767	6,456,668

The duty realised on sugar and molasses for the year amounted to 4,605,094*l.*

In 1844 a change was made, whereby sugar from certain foreign countries, under certain defined circumstances, might be admitted at. 34*s.* instead of 63*s.* duty. In 1845 another act fixed the duty on sugar, from either the East Indies or West Indies, at sums varying from 14*s.* to 21*s.*, according to the quality. The Queen in council was empowered to name certain countries, where slave labour is not employed in the sugar culture, whence brown sugar might be imported at 23*s.* 4*d.* duty, while sugar from all countries not thus specially favoured was to remain at the old duty of 63*s.* By an act passed in 1846, there was to be a gradual reduction of duties from 1846 to 1851, at the expiration of which period the duty on foreign sugar was to be the same as that on East or West India sugar. By another act passed in 1848 this principle of gradual reduction is to extend until July, 1854, after which time sugars from all countries will be placed on the same footing. They will all pay at that time the following import duties per cwt. :—

	s.	*d.*
Refined sugar	13	4
White clayed	11	8
Brown clayed	10	0
Brown raw	10	0
Molasses	3	9

The present duties (Aug., 1850) on brown or raw moist sugar vary from 11*s.* to 15*s.* 6*d.*, according to the countries whence they are imported.

SUHL. [ERFURT.]

SUHM, PETER FREDERIK, was born at Copenhagen, Oct. 18, 1728. In 1746 he entered the university of Copenhagen, and studied jurisprudence; but though he received, two years afterwards, an appointment in the supreme court of justice at Copenhagen, he resigned it, devoting himself entirely to his literary pursuits, more especially to the study of northern history and antiquities. In order to acquire authentic information and materials relative to these subjects, he visited Norway in 1751, and remained there till 1765, when he returned to Copenhagen. Shortly afterwards he began to publish the fruits of his laborious researches in a succession of historical works. Among the most valuable of them are 'Odin, or the Mythology of Northern Paganism,' 1771; the 'Critical History of Denmark,' 4 vols. 4to., 1774–81; and the 'History of Denmark,' 7 vols., 1782, &c. In addition to his various labours as an historian, Suhm distinguished himself in other branches of literature. His 'Idyls,' although not without merit, have little interest at the present day; but his prose 'Tales' founded upon northern legends and traditions are deservedly popular. These and his other miscellaneous productions form the collection of his 'Samlade Skrifter,' in 16 vols., 1788–99. His death took place Sept. 7, 1798.

SUICER (SCHWEITZER), JOHANN CASPAR, was born at Zürich in 1620. After studying at Montauban, he returned to Switzerland, and became the pastor of a country commune in 1643. In 1660 he became professor of Hebrew

and Greek in the university of Zürich, and devoted himself especially to the study of the Greek fathers. He resigned his chair in 1683, and died Dec. 29, 1684.

His chief work, the reputation of which is still great, was his 'Thesaurus Ecclesiasticus,' &c., 2 vols. fol.; best edition, Amst., 1728, 2 vols. fol., with a Supplement by his son, John Henry Suicer.

SUICIDE is the term usually applied both to the act of self-destruction and to him who commits it. The most important distinctions among cases of suicide are founded on the circumstances which lead to its commission. Suicides of all kinds may be divided into classes, according to the condition of mind which has preceded the act, and which in each case constitutes the disposition to self-destruction.

In many cases this disposition is only a part of the general perversion of the judgment in complete insanity: it thus exists in certain maniacs in combination with many other signs of a diseased mind. Some are merely melancholy; some are carried on by delusions which lead them, as if unintentionally, to suicide; some have sensations which they imagine may be cured by such violence as proves fatal; some are driven to the act by commands which they imagine they have received; some destroy themselves at the commencement of insanity, when they are conscious of the malady which threatens them; others, in their convalescence, in horror at the excesses they have committed, or at the mere thought of having been deranged.

There are also cases of monomania in which almost the only indication of insanity is the desire for self-destruction, excited by a delusion respecting some melancholy event, or by some fancied command.

There are conditions of the mind which are not called insanity (in the ordinary acceptation of the term), but which do not less strongly predispose to suicide. Such is especially that named *ennui* or *tædium vitæ*, for which, though it is thought by foreigners to be so common in England that Sauvages has called it 'melancholia Anglica,' we have in our language no term except the very inexpressive one, *spleen*.

The state of the hypochondriac, though of somewhat the same kind, is less dangerous. He is persuaded indeed that his sufferings are irremediable, and that death would be a great relief to him; he even often talks of committing suicide; but he is as irresolute in the use of the means of death, as he is anxious in the use of those of prolonging life; and if he do at last, after repeated postponements, attempt to destroy himself, the attempt is generally, through want of determination, abortive, and he again sinks into the same despondency and inactivity.

In all these cases the suicide is of the chronic or prepense kind.

In the acute or involuntary suicides, the predisposing condition of the mind is the result of circumstances which act rapidly, and pervert a judgment which, before their occurrence, might be deemed sound. Suicides of this kind are probably less frequent than those of the preceding; but they are usually more shocking, and attract more attention: they are especially common in large towns, or wherever men pursue great objects at great hazards.

Lastly, there are examples in which suicide is committed with perfect coolness, being adopted, after due deliberation, as the most judicious course which, in the circumstances of the case, and as far as the knowledge of the individual enabled him to judge, could be followed. Such are many of the cases in which men, finding themselves afflicted with incurable and painful diseases, have shortened that which they believed would be a miserable life; and of the same class are the suicides committed in accordance with national custom, or from superstition, or from patriotic motives. In these cases there is no disorder of the mind.

There are other circumstances of which the influence in producing the disposition to suicide is less obvious, and is detected only by a statistical comparison of the number and characters of the suicides committed under their influence and beyond it. Such are the varieties of climate, of habits of life, of age, &c., on all of which reports, more or less accurate, have furnished useful information.

The names of the following countries are placed in the order of the respective proportions of suicides to the population:—the United States, England, Prussia, France, Austria, Russia, Italy, Spain.

Suicides are more frequent in the latter part of the autumn than in any other season; but the kind of weather which is most favourable to the suicidal disposition is that of long-continued heat and drought. On comparing tables furnished from London, Hamburg, Paris, and Berlin, it appears that the greatest numbers occurred in March, June, and July; and there can be no doubt that spring and summer have a worse influence on the suicidal disposition than either autumn or winter.

The tendency to suicide varies greatly among persons of different stations and occupations. The proportion of annual suicides among masons, carpenters, and butchers, for example, is 1.33 in 10,000; and among tailors, shoemakers, and bakers, 7.43 in 10,000; and, in general, the tendency to commit suicide is twice as great among artisans as it is among labourers. It is not proved that education has, as many have asserted, a tendency to increase the number of suicides: its influence in this respect is not at all discernible. Neither does the state of poverty nor wealth seem to have any material influence; but what all returns agree in proving is, that among the inhabitants of large cities and their neighbourhoods, suicides are much more frequent than among those who live in the rural districts.

The tendency to suicide appears to be much more frequent among men than among women. There is also sufficient reason to believe that in the married state the disposition to suicide is less than in single life. Some difference in this respect however is noticed by M. Prevost between the sexes; for he found that though the number of

suicides among married men was less than that among single men, the proportion among married and single women was just the reverse.

With respect to the treatment of those among the insane who exhibit a tendency to self-destruction, there can be no other deviation from the ordinary treatment of insanity than that which consists in the careful removal from them of all means by which their intentions may be accomplished. Both for these and for those who show no other sign of insanity than their desire for death, the most successful remedy is the giving full occupation for the time: this is indeed essential to the safety of all who show any disposition to suicide. The occupation moreover should be one which will carry the mind as far as possible from the subjects on which it is morbidly sensitive, or on which it has been accustomed to dwell too intently. Above all, a person suspected of an intention to commit suicide should be kept carefully from the contemplation of histories of self-destruction. Numerous instances have proved that the tendency to imitate the acts of others operates as forcibly in producing suicides as in encouraging the most trivial fashion.

SUICIDE (Law) is the death of a person caused by his own act, voluntary or involuntary.

Voluntary suicide, by the law of England, is a crime; and every suicide is presumed to be voluntary until the contrary is made apparent. This crime is called Self-Murder and *felonia de se* (self-felony). A *felo de se* (self-felon) is a person who, being of years of discretion and in his senses, destroys his own life, either intending to do so, or intending to do some other act of a character both unlawful and malicious; as if, in attempting to kill another, under circumstances which would have rendered such killing either murder or manslaughter, a gun bursts in the assailant's own hand, or he runs upon a knife casually in the hand of the person whom he intended to kill. But in no case is self-felony considered to be committed if death do not ensue within a year and a day of the blow or injury; or, in other words, if a whole year intervene between the day on which the blow, &c., is given, and the day on which death takes place.

The legal effect of a self-felony is a forfeiture to the crown of all the personal property which the party had at the time when he committed the act by which the death was caused, including debts due to him; but though the crime is called felony, it was never attended with forfeiture of freehold, and never worked any corruption of blood. The fact that a self-felony has been committed is ascertained by an inquest taken before the coroner or other officer who has authority to hold inquests, upon view of the dead body. [CORONER.]

When a self-felony is found by the inquisition, the jury ought also to inquire and find whether the party had any, and, if any, what, goods and chattels at the time when the felony was committed.

The crown takes the property of the self-felon subject to no liability in respect of his debts or engagements. Upon a memorial presented to the treasury by a creditor of the deceased, a warrant under the sign-manual is generally obtained, which authorises the ecclesiastical court to grant letters of administration to such creditor, who, upon such grant being made, acquires the ordinary rights, and becomes subject to the ordinary liabilities of a personal representative.

Involuntary suicide is death occasioned by the act of the party, either without an actual intention of destroying life or of committing any other wilful malicious act, or without the legal capacity of intending to do so. Neither self-felony nor any other crime can be committed by a child who has not attained years of discretion; nor can it be committed by a person who, by disease or otherwise, has lost, or has been prevented from acquiring, the faculty of discerning right from wrong.

At common law, which in this respect follows the canon law, a person found by inquest to be felo de se is considered as having died in mortal sin; and his remains were formerly interred in the public highway without the rites of Christian burial, and a stake was driven through the body: but this ceremony is abolished by the 4 Geo. IV. c. 52, and a felo de se is buried in a churchyard or other place where he might have been buried if he had not been a felo de se; but the interment must take place within the hours of nine and twelve at night, without any of the rites of Christian burial.

SU'IDÆ, Swine; *Sus*, Linn.; a family of *Pachydermata* of high importance to man for economical purposes.

The swine have on each foot two large principal toes shod with hoofs, and two lateral toes which are much shorter and hardly touch the earth. The incisor teeth are variable in number, but the lower incisors are all levelled forwards. The canines are projected from the mouth and recurved upwards. The muzzle is terminated by a truncated snout fitted for turning up the ground, and the stomach is but little divided.

The *Suidæ* are most numerous in the Old World, only two living species being natives or indigenous of the American continent. This group is resolvable into several distinct genera, as *Sus*, *Babyrussa*, *Phacochœrus*, and *Dicotyles*.

Of the restricted genus *Sus*, we may enumerate the following species.

1. *Sus scrofa*, Linn. (*Sus Aper*, Buffon), the origin of our Common Hog, and once wild in our island. This species is spread extensively throughout Europe and Asia, and inhabits also the Atlas chain of mountains in North Africa. It is everywhere regarded as a beast of chase. Its domestic descendant is too familiar to all to require a detailed notice.

2. *Sus cristatus*, the Crested Hog, is a native of Southern India.

3. *Sus barbatus*, the Bearded Hog, is a native of Borneo.

4. *Sus verrucosus*, the Warted Wild Hog, is a native of Java and the island of Celebes.

5. *Sus vittatus*, the Banded Wild Hog. Locality, Java, Sumatra, and Banca. A smaller variety (*Sus Timoriensis*, Müller) inhabits Timor.

6. *Sus Papuensis*, the Papuan Wild Hog, is common in the forests of New Guinea.

7. *Sus larvatus*, the Masked Wild Hog. This is the *Sus Africanus* of Schreber, the *Sanglier de Madagascar* of Daubenton. Locality, Africa, Madagascar.

The genus *Babyrussa* is represented by only one species, the *Babyrussa alfurus* of Lesson, *Porcus Babyrussa*, Wagner. This animal, of which a living specimen (young) was exhibited a few years since in the gardens of the Zoological Society is limited in its locality to the Moluccas, and a few other islands of the Indian Archipelago. The lower tusks of the male have an extraordinary development, but cannot be readily used as weapons. They cut through the skin of the snout, so as to appear like horns growing in an unusual situation, and do not pass out between the lips as in the Wild Hog. The lower tusks are sharp and powerful.

Babyroussa (*Babyrussa alfurus*).

The genus *Phacochœrus* contains two species, which in general aspect resemble the hog, and were it not that they exhibit in their dentition characters different from those of the genus *Sus*, could not well be removed from it. The molars in structure approximate to those of the elephant.

Of the two species one is the *Ph. Æthiopicus*, or South African Wart-Hog (*Sus Æthiopicus*, Linn., *Ph. Africanus*, Desmar.), which is generally spread throughout Africa. The second species, or the Abyssinian Wart Hog (*Ph. Æliani*, Rüppell), differs from the former in some points of dentition.

Abyssinian Wart-Hog (*Phacochœrus Æliani*).

Both are savage and ferocious, and are greatly dreaded from their strength and their formidable tusks.

The genus *Dicotyles* (Peccaries) is peculiar to Mexico and South America, and there represents the *Suidæ* of the Old World, occupying in the forests of Guiana, Paraguay, &c., the situation of the wild hogs of Europe and Asia.

Two species are known, viz., the White-Lipped Peccary (*D. labiatus*, Cuv.) a native of Guiana, and the Collared Peccary (*D. torquatus*, Cuvier), a native of Mexico, Guiana, Paraguay, &c. It is far less gregarious than the former species. In each a lumbar gland pours forth a secretion of most disgusting odour, and there are several dental and osteological peculiarities which serve to form a strict line of demarcation between these animals, and any of the Old World *Suidæ*.

For a succinct account of the species of the *Suidæ*, see the 'Farmer's Library,' article *Hog*. Refer also to Bell, in 'Brit. Quadrupeds,' Müller, Azara, Buffon, Cuvier, Bennet, and 'Proceedings of the Zoological Society.'

Fossil Suidæ.—Fossil remains of this family have been found in the second division (Miocene of Lyell) and the third and fourth divisions (Pliocene of Lyell) of the tertiary deposits. In the first of these divisions are to be noticed the three species of *Sus* found in the Epplesheim sand. Bones of swine occur frequently in the bone caverns and bone breccia.

SUIDAS, a Greek lexicographer. Eustathius, in his 'Commentary on Homer,' occasionally quotes Suidas the lexicographer; and as Eustathius lived about the end of the 12th century A.D. and the beginning of the 13th, we may conclude that the lexicographer Suidas was at least prior to this time. There appears to be no certain indication in the Lexicon of Suidas which will show who he was or what was his country.

The work of Suidas is a Dictionary arranged alphabetically, but with some deviations from the strict alphabetical order. It contains both proper names, as names of persons and places, and words which belong to a dictionary of a language in the modern acceptation of the term. It contains names of persons both from profane and sacred history. The work is compiled from numerous writers, some of whom are mentioned in a list prefixed to the Lexicon. The work is deficient in plan, and defective and inaccurate in the execution. But with all its defects the work is very useful, and of great assistance for the literary history of antiquity, and for illustrating the meaning of many words. It also contains numerous passages from ancient writers who are lost.

The last and most complete edition of Suidas is by Gaisford, 3 vols. fol., Oxford, 1834. The first two volumes contain the text, and the third contains the indexes.

SUIT is a legal term used in different senses. The word *Secta*, which is the Latin form, is from 'sequor,' to follow; and hence the general meaning of the word may be deduced.

1. A suit in the sense of litigation is a proceeding by which any legal or equitable right is pursued, or sought to be enforced in a court of justice. Where the remedy is sought in a court of law, the term Suit is synonymous with Action; but when the proceeding is in a court of equity, the term Suit is alone used. The term is also applied to proceedings in the ecclesiastical and admiralty courts.

2. Suit of Court, in the sense of an obligation to follow, that is, to attend, and to assist in constituting, a court, is either real or personal.

Suit-Real, or rather Suit-Regal, is the obligation under which all the residents within a leet or town are bound, in respect of their allegiance as subjects, to attend the king's criminal court for the district, whether held before the king's officer and called the Sheriff's Tourn, or held before the grantees of leets or the officers of such grantees, and called Courts-Leet. [LEET.]

Suit-Personal is an obligation to attend the civil courts of the lord under whom the suitor holds lands or tenements; and this is either Suit-Service or Suit-Custom. If freehold lands, &c., be held of the king immediately, or, as it is feudally termed, in chief, suit-service is performed by attendance at the county court, the court held by the king's officer, the sheriff, unless the lands, &c., constituted an entire barony, in which case the suit demandable from the tenant was his attendance as a lord of parliament. If freehold lands, &c., are held mediately only of the king, but immediately (or in chief) of an inferior lord, the suit demandable is attendance at the court baron of the lord. In manors [MANORS] where there are copyhold, that is customary, estates, the custom of the manor imposes upon the copyholder an obligation to attend the lord's customary court; but as this obligation is not annexed by tenure to the land held by the copyholder, but is annexed by custom to his position as tenant, the suit is not suit-service but suit-custom. In the case of freeholders attending as suitors the county court or the court-baron (as in the case of the ancient tenants per baroniam attending parliament), the suitors are the judges of the court, both for law and for fact, and the sheriff or the under-sheriff in the county court, and the lord or his steward in the court-baron, are only presiding officers with no judicial authority. But in the criminal jurisdiction of the tourn and leet, the sheriff and the grantee of the leet, or his steward, are the judges; and the suitors act only a subordinate part.

In the customary court, though its functions are confined to matters of a civil nature, the judicial power is wholly in the lord or his steward.

3. Besides suit of court, *secta ad curiam*, there are other species of personal suit, which, like suit of court, are divisible into suit-service and suit-custom. Of these the most usual is Suit of Mill, *secta ad molendinum*, which is where, by tenure or by custom, the freehold or customary tenant is bound to grind his corn at the lord's mill.

SULI, a mountainous district of Southern Albania, which extends in length about 30 miles from N. to S., and about 20 in breadth, and is separated from the coast of the Adriatic by a strip of lowland on which is Port Fanari, the ancient Elæa, at the mouth of the Acheron. On the south-east the highland of Suli is bounded by the plain of Arta, which extends to the gulf of the same name. Towards the north Suli borders on the district of Paramithia, and on that of Janina towards the north-east. The river Glyky, the ancient Acheron, coming from the north, flows along a deep valley which intersects the highlands of Suli, and after being joined by several streams enters the Adriatic at Port Fanari. The district of Suli is part of the ancient Thesprotia, one of the three great divisions of Epirus. It contains eighteen villages or hamlets, of which ten or eleven are in the highlands, and the rest in the plain at the foot of them. The principal village, called Mega Suli, lies on a hill near the left bank of the Acheron; not far from it is the village of Kiapha, and higher up the mountain is that of Kungi. In the plain, at the foot of the mountain, the principal village is called Securates. The mountains of Suli produce only pasture and timber-trees, but the plain is cultivated, and yields corn, pulse, and other provisions. The houses are rudely built, and the country is altogether poor. The whole population of Suli, at the time of the war with Ali Pacha, did not amount to more than 12,000, divided into about thirty tribes or clans. The head of each clan was styled captain, and led his contingent in war, subject to a supreme commander styled Polemarch, who was chosen by votes for the time.

In the war between Russia and the Porte (1787–92), the Suliotes were active partisans of Russia, and Suli was the centre of the insurrection against the Ottomans, which broke out in various parts of Greece. In 1789 Ali Pasha of Janina sent a considerable force against the Suliotes, who defeated it with great loss. In the following year, the Suliotes having joined with the Klephts of Pindus and other mountainous districts, ravaged Acarnania, as far as the Achelous, and they afterwards overran the territory of Arta and Janina under the very eyes of Ali Pasha. But the peace of 1792, between Russia and the Porte, left the insurgents exposed to the vengeance of the Turks. Ali Pasha undertook to exterminate the Suliotes; but after having penetrated with a large force into their district, and taken Mega Suli and Kiapha, he was completely routed by the Suliotes under George Botzari, and fled to Janina. Ali then concluded a truce with Suli, which lasted till May, 1801, when he commenced a war of extermination against this brave people, and at last succeeded. [ALI PASHA.] About 4000 of the population escaped and contrived to reach Parga, whence they went to the Ionian Islands, then under the protection of Russia. In the war for the independence of Greece, a body of Suliotes fought at Missolonghi against the Turks.

SULIMAN MOUNTAINS. [AFGHANISTAN.]

SULIMANIEH. [BAGDAD.]

SULITELMA. [SWEDEN.]

SULLA is the cognomen of a branch of the Patrician gens Cornelia. This branch originally had the name of Rufus or Rufinus, which appears to have fallen into disuse, and to have given way to the new cognomen Sulla, which had the same meaning as Rufus, and was first borne by the Flamen Dialis.

The only person of the name who requires a notice here is the Dictator Sulla.

L. Cornelius Sulla Felix, the son of L. Cornelius Sulla, was born in B.C. 138. His father was poor, but the son received an education as good as any of the young Romans of that time.

He indulged however in all kinds of debauchery; and loose women, actors, and buffoons were his favourite companions to the end of his life. Nicópolis, one of his mistresses, who possessed considerable property, bequeathed it all to him. His fortune being thus improved, he was enabled to enter into competition with others for the honours of the republic. In B.C. 107 he was appointed quæstor, and was sent with a detachment of horse to join the army of Marius, who was then carrying on the war against Jugurtha. Sulla soon showed himself to be the most active and skilful officer in the Roman camp, and gained the confidence and admiration of Marius. He also possessed in the highest degree the art of winning the affection of his soldiers. In the battle of Cirta, Sulla commanded the horse, and greatly contributed towards the victory over Jugurtha and Bocchus. After this victory Bocchus began his treacherous negociations with the Romans, and Marius sent Sulla and A. Manlius as ambassadors to Jugurtha. By his duplicity Sulla induced Bocchus to deliver up Jugurtha into his hands.

When Marius, in his second consulship (104 B.C.), undertook the war against the Cimbri and Teutones, he made Sulla his legate, who distinguished himself. But in the third year, 102 B.C., he left Marius, and joined the army of Lutatius Catulus, the colleague of Marius, who was stationed with a force in the north of Italy.

After the defeat of the Cimbri (101 B.C.) Sulla returned to Rome. In B.C. 93, by canvassing and bribery, he was made prætor urbanus. The year after his prætorship he went as proprætor to Cilicia with a commission to restore King Ariobarzanes to his kingdom of Cappadocia, from which he had been driven through the influence of Mithridates. This object was soon accomplished. In B.C. 91, when Sulla returned to Rome, Caius Censorinus brought against him the charge of repetundæ, or malversation, in his office of proprætor, but did not follow it up. In this year the Marsic or Social War commenced, and for a time delayed the outbreak of the furious hostility between Marius and Sulla. Both of them commanded separate divisions of the Roman army; but Sulla distinguished himself much more than Marius. In B.C. 89 Sulla was legate of the consul L. Cato, and destroyed the Campanian town of Stabiæ. He also defeated L. Cluentius near Pompeii, pursued him as far as Nola, and compelled the Hirpini to submit. In Samnium he took Bovianum by storm. During this war Sulla left nothing untried to gain the goodwill of the soldiers; and he even connived at their gross excesses. When the time approached for electing the consuls for the year following, Sulla went to Rome to offer himself as a candidate. His successful campaigns had gained him such popularity, that he was elected consul for the year B.C. 88. He was now in the 49th year of his age. His colleague was Q. Pompeius Rufus, who obtained Italy as his province. Sulla had Asia and the command in the war against Mithridates. The Social War was still going on, and Marius was not only exasperated because his former quæstor was now his equal, but was at the same time anxious to get the command in the war against Mithridates, and he persuaded the tribune P. Sulpicius to give him his assistance in depriving Sulla of his power. While Sulpicius was agitating to overthrow the rival of Marius, Sulla, who was with his army near Nola, returned to Rome to oppose the measures of his enemies. In a tumult that ensued, Pompeius, the colleague of Sulla, was obliged to take to flight, and his son, who had married a daughter of Sulla, was murdered. Sulla himself returned to his army at Nola, and the command in the war against Mithridates was given to Marius. Messengers from Rome came to the camp of Sulla with orders for him to surrender the command; but Sulla led his men to Rome, which he entered by force. Marius escaped to Africa, and Sulpicius, betrayed by one of his slaves, was put to death.

After this defeat of the Marian party, Sulla repealed the measures of Sulpicius, and he remained at Rome until the consuls for the year following were elected. The consuls for B.C. 87 were Cn. Octavius and L. Cinna. Cinna was a man of the popular party, and Sulla, pretending to be glad to see that the people made use of their freedom in the elections, contented himself with making Cinna promise with an oath that he would not disturb the actual order of things. Sulla now left Rome, and, crossing the sea, landed at Dyrrachium, and marched towards Athens, which Archelaus, the general of Mithridates, had made his head-quarters. After a long siege and a desperate defence, Athens was taken by storm (86 B.C.) with great slaughter. Sulla, who received no supplies from Italy, did not scruple to make use of the rich treasures of the Greek temples; and Athens among the rest suffered severely; for Sulla had been provoked during the siege by the insulting conduct of Aristion, then tyrant of Athens. Archelaus collected all his forces in Greece, and received great reinforcements from Asia, but Sulla gained two victories over him, one at Chæronea (B.C. 86), and the other at Orchómenos in Bœotia (B.C. 85).

Soon after his landing in Asia, Sulla concluded a peace with Mithridates (B.C. 84). He had several reasons for wishing to put an end to the war. During his absence from Italy the popular party had recovered its ascendancy, and his own party was almost annihilated. The most distinguished senators had taken refuge in his camp in Greece, and they, together with his wife Cæcilia Metella, who had likewise fled from Rome, urged and entreated him not to forsake them. Two years before the peace with Mithridates, the consul L. Valerius Flaccus, who was of the popular party, had appeared with a force in the Ionian Sea, under the pretext of carrying on the war against Mithridates. Flaccus was murdered (B.C. 85) by his own legate C. Fimbria, who placed himself at the head of the troops, and was successful in several engagements with Mithridates. After Sulla had concluded a peace with the King in the plains of Troas, he set out against Fimbria, who being betrayed by his own soldiers put an end to his life.

Sulla had to satisfy the demands of his soldiers, who had expected to enrich themselves in the war against Mithridates; and to raise the necessary money he resorted to the most oppressive measures. After he had thus secured the attachment of his soldiers, he entrusted the two legions of Fimbria to his legate L. Licinius Murena, and sailed with his fleet and the remainder of his army from Ephesus to Athens. He took away from Athens the library of Apellicon, the father of Aristion, which contained most of the works of Theophrastus and Aristotle, and carried it to Rome. His passage to Brundusium was probably made in the spring of the year B.C. 83.

The forces of the hostile party in Italy amounted to 200,000 men. Cinna had increased his preparations as soon as he heard that Sulla was on his way to Italy. In consequence of a letter which Sulla, while yet in Asia, had addressed to the senate, it had been decreed that negociations should be entered into in order to effect a reconciliation between Sulla and his enemies. The consuls Cinna and Carbo paid no attention to this decree. But a mutiny broke out among the soldiers, and Cinna was murdered, 84 B.C. The popular party, deprived of their leader, had no alternative but to continue their resistance or to yield to an enemy who would not pardon. In the first battle which Sulla fought with the consul Norbanus, near Capua, he was successful; and while a truce was concluded with Norbanus, the army of the other consul, L. Scipio, was persuaded to abandon their general. In the year following (B.C. 82), young Marius and Cn. Papirius Carbo were consuls. Marius was defeated by Sulla in the battle of Sacriportus, upon which he fled to Prænestе, and Rome was taken by the conqueror. Carbo, who was successively attacked by Metellus Pius, Pompeius, and Sulla himself, was compelled to seek refuge in Africa. The Samnites and Lucanians, under the command of Pontius Telesinus and M. Lamponius, made a fruitless attempt to relieve Prænestе, and then marched against Rome, but they were defeated in a great battle at the Colline gate (B.C. 82). Sulla, on the third day after this victory, ordered several thousands of the Samnite prisoners to be cut down in the Campus Martius. During the time that this slaughter was going on, Sulla held a meeting of the senate, and when the senators became uneasy at the groans of the dying prisoners, he told them to listen to what he was proposing, and not to mind what was doing outside. This victory was soon followed by the taking of Prænestе. The Romans who were found there among his enemies were pardoned, but the Samnites and Prænestines, amounting, according to Plutarch, to 12,000, were put to the sword. Young Marius persuaded a slave to put an end to his life.

The war was continued in Africa by Carbo, and in Spain by Sertorius. Sulla gratified his vengeance by proscriptions, by which he was enabled to get rid of those whom he had to fear, and to reward his friends and his soldiers. Many thousands were proscribed, that is, were declared out of the protection of the law, and any one was authorised to kill them. Those who killed a proscribed person, or gave notice of his place of concealment, received two talents as a reward, and those who gave shelter to him forfeited their own lives. Lists containing the names of the proscribed were put up in public. The property of the proscribed was seized, and sold by auction or given away. The consequences were, according to the will of the tyrant, to extend to the descendants of the proscribed, inasmuch as they were to be excluded from all honours and public offices. But the vengeance of Sulla was not confined to the city. All the Italians who had in any way opposed the party of Sulla were punished in the same manner, and numbers of them were murdered and their property confiscated. Whole cities were punished by the imposition of heavy fines, or by the demolition of their fortifications. He formed at Rome, for the security of his own person, a body-guard consisting of ten thousand slaves, to whom he gave their freedom and the franchise, and who were called after their patron, Cornelii. The people were silenced by fear, all the acts committed by the tyrant were ratified by a vote of the people, and a gilt equestrian statue was erected to him in front of the rostra, with the inscription 'Cornelius Sulla Imperator Felix,' 'Sulla the Fortunate;' a name in which he gloried, for he was a believer in dreams and omens, as superstitious as he was voluptuous and cruel; yet, with an inconsequence which formed a feature in his character, he would plunder temples and treat the gods with contempt. In accordance with his own expressed wish, Sulla was made dictator (B.C. 82), an office which had not existed for the last 120 years. In order however to leave to the people some appearance of liberty, he permitted them to elect consuls as usual, and he himself, in B.C. 80, held the office of consul in addition to that of dictator. In the year B.C. 81, he enjoyed a triumph for his victories in the war against Mithridates, and his splendid games and feastings, which lasted for several days, made the people forget for a time their wretched condition.

After Sulla had annihilated the popular party, he began to direct his attention to a reform in the constitution and in the administration of justice. The laws, which are known under the name of 'Leges Cornelie,' may be divided into three great classes:—1, constitutional regulations; 2, criminal laws; and 3, those which were intended to improve public morals.

The constitutional laws of Sulla were intended to restore the old aristocratic form of the republic. Sulla was one of those men who believe that old institutions can be revived or preserved by the mere letter of the law. But his reformed constitution did not survive him many years. The principal part of his reform consisted in depriving the comitia tributa of all their legislative and judicial powers, and of the right to elect the members of the great colleges of priests, which the people had exercised for some time. He left to the comitia of the tribes only the power to elect the inferior magistrates, as tribunes, ædiles, and quæstors. The power of the tribunes of the

people thus received a fatal blow. The whole of the legislative power was given to the Comitia Centuriata, but in such a manner that no legislative measure could be brought before them without having previously received the sanction of the senate. He also allowed no appeal to the people from the sentence of a magistrate.

All the Roman writers agree that Sulla gave the judicia (either the publica and privata, or the former alone) to the senate. The laws which he caused to be enacted for the preservation of public morals related chiefly to marriage and luxury.

After the annihilation of his enemies, and the establishment of a new order of things, Sulla betook himself to his old enjoyments. He abdicated the dictatorship, because the love of pleasure was stronger in him than that of the possession of power. But though he gave up power in name, he had it in reality. The 10,000 Cornelii remained after his abdication as attached to him as they had been before, and they were ready to take up arms for their patron at any moment, as their own safety depended upon his. The party of Sulla was in possession of all the power at Rome, and in Italy his numerous legions were as ready to take up arms in his defence as the Cornelii. He could therefore withdraw without any danger or fear, and how well he had calculated is clear from Plutarch ('Sull.,' 37), for even during his retirement to private life his will was regarded as law. Soon after his abdication he retired to his villa near Puteoli, where he spent his time partly in literary occupations, partly in hunting and fishing, and partly in giving himself up to the pleasures of the table, and of women, actors, and dancers. He died in the year B.C. 78, at the age of sixty. The cause of his death is not quite certain. Appian says he died of an attack of fever, while others inform us that the loathsome disease called phthiriasis, or the lousy disease, was the cause of his death. Two days before his death Sulla had finished the twenty-second book of his 'Memoirs,' which was used by Plutarch in his Life of Sulla. His body was carried to Rome with great pomp, and burnt in the Campus Martius according to his own request. A monument also was erected to his memory in the Campus Martius, with an inscription said to have been written by himself.

Sulla was married five times, and left two children, Faustus Cornelius Sulla and Fausta, who were twins by his fourth wife Cæcilia Metella. One daughter was born, after his death, by his fifth wife Valeria.

(Respecting the history of the family of the Sullas, see Orelli, *Onomasticon Tullianum*, ii., p. 192, &c.; Drumann, *Geschichte Roms*, &c., ii., p. 426, &c. For the history of the dictator Sulla, and his legislation in particular, see Zachariæ, *L. Cornelius Sulla*, &c., Heidelberg, 1834, 2 vols. 8vo.; and Plutarch's *Life of Sulla*, translated, with Notes, by G. Long.)

SULLY, MAXIMILIEN DE BETHUNE, DUC DE, born at Rosny, Dec. 13, 1560, was descended from a younger branch of the family of Bethune, in the Netherlands. In 1572 he was placed by his father, the Baron de Rosny, in the service of Henri, the young king of Navarre, who was at that time on his way to Paris, to conclude his matrimonial engagement with the sister of Charles IX., king of France. In Paris he attended the classes of the College of Burgundy. By the assistance of the principal of that institution he escaped the massacre of St. Bartholomew. At the beginning of 1575, he accompanied Henri in his escape from the confinement in which he was kept by the French court. Rosny was now, in his fifteenth year, immersed in the toils and cares of active life: the death of his father about the same time left him entirely his own master. It was in nineteen years of civil war that he developed and cultivated without guide or master the character and talents which he displayed as minister of France.

At first Rosny accepted an ensigncy in the regiment of foot of which his relation Lavardin was colonel, and in this capacity he became as remarkable for his intrepidity as he was for his prudence in civil affairs. The rents of his property and the booty he obtained in the storming of several towns, enabled him to maintain a small company of men-at-arms; and with these he attached himself exclusively to the person of the King of Navarre, who made him a councillor of the kingdom in his twentieth year, with a salary of 2000 livres.

He was persuaded in 1581 to accompany the Duke of Anjou to the Netherlands; but he returned in 1583 to the King of Navarre, and was almost immediately dispatched to Paris to keep an eye upon the intrigues there going forward. In Dec., 1583, he married Anne de Courtney, and spent the whole of 1584 with his young wife at Rosny. Though retired from public life, he was not idle. His husbandry was so good that when he rejoined Henri in 1585, he carried not only himself and his troop, but a good round sum of money which he had gained by a speculation in horses, to assist his master in prosecuting the war. Rosny's devotion to the cause of Henri was deep and unalterable. He was employed in many delicate and difficult negociations; and at the battle of Coutras (Oct. 20, 1587), where he commanded the small park of artillery, he contributed mainly to the gaining of the victory.

The services of Rosny, after the assassination of the French king Henri III., and until the entry of Henri IV. into Paris (March, 1594), were great. By persuading his master to embrace the Roman Catholic faith (a course which his sagacity pointed out as imperative), he was the main instrument in opening the gates of Paris; and to this obligation he added, about the same time, that of gaining the services of the grand-admiral Villars and the possession of Rouen. Long before Henri had established himself securely on the throne of France, he had felt severely the dilapidated state of the national finances. One of his first wishes, on finding himself in a state of comparative tranquillity, was to secure the services of Rosny; but the fact of his being a Protestant, and the jealousy of the professional financiers, prevented Rosny from being formally installed as a member of the great council of finance until 1596. On receiving the appointment, his first step was to obtain from

the king the appointment of a commission of inquiry into the state of the revenue and its collection in all the districts into which the kingdom was divided for financial purposes. Four of the principal districts were reserved for his own inspection. In the course of a tour which he made through them he detected the various means by which money was diverted from the treasury, and the king kept poor, at the same time that over-exactions were levied upon the people. He collected arrears of taxes which had been allowed to lie over, and returned to Paris not only with evidence of abuses in the management of the finances, but with a considerable sum of money in hand. He was soon afterwards promoted to be superintendant of finance, and entered upon the discharge of his duties with a zeal that amounted almost to a passion. When he undertook the management of the finances, in 1597, the treasury was empty and in debt; after the death of Henri IV., in 1610, forty-two millions of livres were found in it.

His success in this department led to his appointment as grand-master of the artillery, director of the marine, master of works, and director of bridges and highways. He became in fact sole minister of France. In addition to these duties of routine, he was frequently engaged in important negociations. In 1601 he was delegated to meet Queen Elizabeth at Dover, where arrangements were made for an alliance against the house of Austria. In 1603 he was sent as ambassador to James VI. on his succession. Honours and emoluments flowed in upon him. In 1606 he was created Duc de Sully and a peer of France. His advice was taken and his services employed by the king in his most delicate family arrangements, as well as in the affairs of the state.

The murder of Henri IV. in 1610 terminated the career of Sully as minister. Early in 1611 he gave up the offices of superintendant of finance and governor of the Bastile.

From that time the château of Villebon became his principal residence. He had retained his government of Poitou, and the direction of the artillery, the fortifications, and the roads and bridges; so, though retired from court, his life was neither private nor inactive. He was appointed a marshal of France by Louis XIII., in 1634. The favourite amusement of his declining years consisted in preparing his Memoirs 'of the great and royal economies of Henri IV.' for publication. The prodigality of his son (who died before him) involved him in some disagreeable embarrassments; and the decision against him in a suit which his grandson had been instigated to commence is supposed to have hastened his death. He died at Villebon, Dec. 22, 1641. The first two volumes of Sully's 'Mémoires' were published in 1634, but without date; the 3rd and 4th volumes in 1662.

SULMO'NA, a town of the kingdom of Naples, in the province of Abruzzo Ultra II., is situated in a deep valley drained by the Sagittario, an affluent of the Pescara, and enclosed by high and naked mountains. This valley forms an important pass between the central and northern provinces of the kingdom, leading from the valley of the Pescara to that of the Sangro, from whence the road is continued to the valley of the Volturno by Isernia. The ancient Sulmo, Ovid's birth-place, stood at some distance from Sulmona. The town, which is walled, looks old and gloomy, like most towns of Abruzzo. It gives title to a bishop, and has about 8000 inhabitants, a college, a clerical seminary, a cathedral, and 15 other churches; some paper-mills, and manufactories of catgut, sugar-plums, and sausages. The valley of Sulmona, which is intersected by several streams and irrigated by artificial canals, is productive of corn, wine, and oil. Sulmo was one of the chief towns of the Peligni, a people of Sabine origin; there are now no traces of it.

SULPHATE OF LIME. [CALCIUM.]

SULPHUR, commonly called *Brimstone*, is a solid elementary non-metallic body, which has been known from the remotest antiquity. It is met with pure, and in various states of combination. Thus it is found combined with numerous metals and in immense quantity, as with iron, forming the sulphuret and bisulphuret, with copper, lead, antimony, &c., constituting the principal ores of these metals; it is also found largely combined with oxygen, forming sulphuric acid, which is generally united with an earthy base, as with lime, constituting sulphate of lime, or gypsum, and with barytes, strontia, and magnesia, giving rise to the sulphates of these bases. It occurs also, but in smaller quantity, and principally in mineral waters, such as those of Harrowgate, combined with hydrogen, the resulting compound being sulphuretted hydrogen gas, or hydrosulphuric acid. Sulphur is also a constituent of some animal substances, as eggs, urine, &c.: it is found also in certain plants.

Sulphur, both crystallised and massive, occurs in beds and veins, in Swabia, Hungary, and Switzerland. Volcanic sulphur is found in immense quantities in Italy and Sicily. The volcanic sulphur brought to this country is purified for use. What is called *Refined Sulphur* is purified by distillation in a large cast-iron still, and it is condensed in an iron receiver kept cool by water; when melted and cast into wooden moulds, it is called *Roll* or *Stick Sulphur;* and when the vaporised sulphur is condensed in a large chamber, it has the form of powder, and is called *Sublimed Sulphur*, or *Flowers of Sulphur.*

Sulphur is of a bright yellow colour, resinous lustre, slight odour, and nearly opaque. Its specific gravity is about 2.0. It is insoluble in water, but dissolves in alcohol and in boiling oil of turpentine. Sulphur is a bad conductor of heat. It is very volatile, and when it is rubbed in the dark on a brick, or any other substance by which it is heated, though not sufficiently to inflame it, an extremely weak blue flame arises, exhaling a peculiar odour: this flame is not however occasioned by combustion, it merely accompanies the evaporation of the sulphur, for a cold body held over it is covered with flowers of sulphur. When sulphur is heated it begins to vaporise before it fuses: at 555 to 600° it is rapidly volatilised, and in close vessels is condensed without change. Some metals when heated

in it burn vividly.. The fusing-point of sulphur is 232°, and between this and 280° it possesses the highest degree of fluidity: at 320° it begins to thicken, and at 482° is so tenacious, that it will not flow from an inverted vessel: from this to 600°, which is its boiling-point, it again becomes liquid, but not so perfectly so as at 280°; when boiled in close vessels, an orange-coloured vapour is formed. When poured into water in a fluid state, at about the temperature of 428°, it becomes a brown pasty mass, which readily receives and retains any form given to it, and hence it is employed in taking casts.

Oxygen and Sulphur form several important compounds. One of these, *Sulphurous Acid*, ($S^1 O^2$) is a gas produced by burning sulphur in oxygen. It is colourless, and permanently elastic, except at a temperature of 45° and a pressure equal to two atmospheres, when it is rendered fluid. It has a pungent and suffocating odour, being that experienced whenever sulphur is burned: its taste is disagreeable and acid: it extinguishes burning bodies, is not inflammable, and is fatal to animals. Water at 60° dissolves from 33 to 37 times its volume of this gas; and by heating the solution it is evolved unaltered. The solution possesses the smell of the gas itself; and, like it, has the property of bleaching some vegetable and animal substances: hence the employment of the vapour of burning sulphur in whitening hops, silk, and wool. Sulphurous acid combines with various bases to form salts, which are called *Sulphites;* these salts, of various metals, earths, and alkalies, are numerous, but not very important: all of them become *Sulphates* by exposure to the air, from which they abstract an additional equivalent of oxygen.

Sulphuric Acid ($S^1 O^3$) is the most abundant and important of all the compounds of sulphur. In its usual state it is familiarly known as *Oil of Vitriol*, and contains 1 equivalent of water to 2 of pure acid. It is produced from green vitriol or sulphate of iron, and is a heavy dark-coloured liquid; but by a further chemical process the water is driven off, and anhydrous or pure sulphuric acid remains. This anhydrous acid is a colourless crystalline solid; it is tough and elastic; liquefies at 66°, and boils at a temperature between 104° and 122°, forming a transparent vapour, provided no water is present; it unites with moisture when exposed to the air, and forms with it dense white fumes. The hydrated or common acid is produced by a complicated chemical process, in which sulphur and nitrate of potash are the chief agents. As thus prepared, sulphuric acid is a limpid, inodorous, colourless fluid, of an oily consistence, and a specific gravity of about 1.8: it boils at about 627°, and distils over unchanged; the boiling-point diminishes with dilution. This acid is intensely caustic and acrid, and readily decomposes animal and vegetable fibre. Its affinity for water is very great. When suddenly mixed with water, much heat is evolved, and, on cooling, condensation is found to have taken place, the two fluids occupying less space than before mixture. The salts which sulphuric acid forms with various bases are termed sulphates, sesqui-sulphates, or bi-sulphates, &c., according to circumstances: they are a very important class of saline bodies, and those of most use will be found described under their respective bases. Sulphuric acid in its concentrated state acts in general only slightly, if at all, on the metals. The acid and all its sulphates are decomposed by the salts of barytes and of lead.

Hyposulphurous Acid ($S^2 O^3$) has not been obtained in a separate state, but it is known to exist in combination. The salts containing hyposulphurous acid, or the *Hyposulphites*, are not important; and the acid undergoes decomposition when they are strongly heated or acted upon by an acid. *Hyposulphuric Acid* ($S^2 O^5$) has not been obtained free from water: the aqueous solution is sour, inodorous, and reddens vegetable blues: if heated to 212°, it is decomposed into sulphurous and sulphuric acids; and when exposed to the air, it slowly absorbs oxygen, and becomes sulphuric acid.

Hydrogen and Sulphur combine in two proportions, forming hydrosulphuric acid, frequently called sulphuretted hydrogen gas, and bisulphuret of hydrogen. *Sulphuretted Hydrogen* ($S^1 H^1$) which is a constituent of Harrowgate and other sulphurous waters, is colourless, and gaseous at common temperatures and pressures: it has a peculiarly nauseous and fetid odour, resembling that of putrid eggs; its taste is also extremely disagreeable. Its specific gravity is about 1.18: 100 cubic inches weigh about 36.55 grains. It is soluble in about one-third of its bulk of water. At a temperature of 50°, and under a pressure of about 17 atmospheres, it is rendered a limpid liquid, of specific gravity about 0.9: this does not congeal when cooled down to 0 Fahr. It is extremely poisonous to animals. Air containing 1-1500th of its bulk immediately killed a bird, and 1-1000th a middle-sized dog. When mixed and detonated with oxygen gas, the results are water and sulphurous acid. It forms salts with the alkalies and earths, termed *Hydrosulphates*. *Bisulphuret of Hydrogen* ($S^2 H^1$) is a viscid liquid, of a yellow colour, and of specific gravity about 1.77; its smell is similar to but not so powerful as that of hydrosulphuric acid; its elements are held together by a feeble affinity, so that even in the cold it is gradually converted into hydrosulphuric acid and sulphur, and this change is immediately produced at 212°.

Chlorine and Sulphur form two compounds; viz. the *Chloride* ($S^1 Chl^1$), a reddish-brown, heavy, but volatile liquid; and the *Dichloride* ($S^2 Chl^1$), a greenish, heavy, volatile liquid, which decomposes water. Other compounds of sulphur are noticed under BROMINE, PHOSPHORUS, and IODINE.

Carbon and Sulphur form by direct action *Sulphuret of Carbon*, or rather *Bisulphuret* ($S^2 C^1$). It is a colourless transparent liquid, of density 1.272, that of its vapour being 2.668; it has an acrid pungent taste, and a very fetid odour; its refractive power is very high; it is insoluble in water, but combines with alcohol and æther, from which water precipitates it; it is extremely volatile, boils at about 110°, and it is not rendered solid at −60°: owing to its great volatility it produces

sufficient cold under the exhausted receiver of the air-pump to freeze mercury: it is extremely inflammable. *Sulphur* and *Boron* are supposed to form more than one compound; but they have not been much examined.

Sulphur combines also with various compound bodies to form very different substances: some of these we shall briefly mention.

Sulphur and Cyanogen unite to form *Sulphocyanogen* (S^2 Cy^1): it is a yellow powder, insoluble in water, alcohol, and æther, but dissolves in hot sulphuric acid, from which water precipitates it. *Sulphocyanic Acid* (Sulphocyanogen^1, H^1) is a colourless liquid, easily decomposed by exposure to air or heat. *Sulphonaphthalin* (C^{20} H^8 Sulph. Acid^2), is crystalline, readily soluble in water and in alcohol; when strongly heated, it is decomposed; it has an acid bitter taste; it combines readily with alkalies, forming salts which are called *Sulphonaphthalates*. *Sulphovinic Acid* (Sulph. Acid^2 Alcohol^2) is a peculiar compound which has not been produced in the anhydrous state.

Sulphur Salts.—These are certain double sulphurets, so designated by Berzelius: the electro-negative sulphurets, constituting *Sulphur Acids;* and the electro-positive sulphurets, *Sulphur Bases*. Among the sulphur acids are the sulphurets of arsenic, antimony, tellurium, tin, &c.; and in this class he also includes sulphuretted hydrogen, sulphuret of carbon, and selenium and sulphocyanogen. The sulphur bases include the protosulphurets of the metals of the alkalies and alkaline earths.

Sulphur Trade.—Although sulphur exists in Iceland, Teneriffe, St. Vincent's, and some other places, the expense of obtaining it is so great, that Sicily alone has furnished the supply required. From 1833 to 1838 England took 49 per cent. of the whole quantity of sulphur exported from Sicily, and France 43 per cent., leaving only 8 per cent. for all other countries; and part of this was shipped for Malta, and eventually reached England. The Sicilian sulphur-mines are the property of individuals, and from fifteen to twenty English firms settled in Sicily are engaged in the trade. In 1836 M. Taix, a Frenchman, laid before the Sicilian government a project for establishing a company which was to have the exclusive right during ten years of purchasing Sicilian sulphur at fixed prices, on condition of spending 10,000*l.* a year in constructing roads, and exporting one-third of the quantity produced in Sicilian vessels. The British merchants becoming alarmed, the Sicilian government, in reply to the British ambassador, stated that no such project would be adopted. It would have been in direct contravention to certain commercial treaties between the two governments. The Sicilian government did however enter into a contract with M. Taix, and on the 4th of July, 1838, notice was given at Palermo that the monopoly would come into operation on the 1st of August ensuing. The negociations respecting this monopoly were conducted with great secrecy, and it came into operation so suddenly that twenty-four vessels lost their cargoes. The British lessees of mines, and all others, were compelled to produce only a fixed quantity of sulphur; prices rose more than twofold, contracts could not be completed, the supply became inadequate to the English demand, and other quarters were looked to for a supply. At length the British government took very decided steps to put an end to a monopoly established in the face of commercial treaties; and the trade was then restored to its former footing.

The quantity of sulphur imported into Great Britain in the first 8 months of 1849 amounted to 637,740 cwts. The import duty on sulphur was repealed in 1845.

Medicinal Properties of Sulphur.—For medical purposes sulphur should be as pure as possible, but in the two forms in which it occurs it is seldom perfectly free from admixture. Sublimed Sulphur (Flowers of Sulphur) generally contains some sulphuric acid, which renders it slightly pungent; and Precipitated Sulphur, or Milk of Sulphur, mostly contains sulphate of lime. Of the two forms, precipitated sulphur, owing to the extremely fine state of subdivision in which it exists, is in equal quantities more powerful than the sublimed. Sulphur is insoluble in alcohol, but soluble in oils, both fixed, such as linseed, and volatile, such as turpentine.

Sulphur should not be used for very plethoric individuals, or those inclined to high vascular action, till those states have been lessened by diet and other means. Sulphur is given as a laxative in hæmorrhoids, stricture of the rectum, and habitual constipation. For these cases it is usually combined with bitartrate of potash, or magnesia, or electuary of senna. Persons of a sedentary habit, afflicted with constipation, find this combination of unspeakable service, as, unlike many others, it is not followed by greater constipation than before, but keeps the bowels moderately open for a considerable time. Sulphur is generally given internally at the same time that it is used externally for the cure of cutaneous diseases. For one of these (*scabies*) it is regarded as almost a specific. Sulphur ointment is the form generally employed for this disease. It should never be applied to more than a fourth part of the body at one time.

SULPHURATION, or SULPHURING, is the process of bleaching employed to give whiteness to silk and woollens by exposing them to the fumes of burning sulphur. For this process a detached chamber, without a chimney, is made use of, but so constructed that, when required, a current of air may be passed through it. Straw-plat work is also bleached by sulphuring.

SULPHURIC ACID, *Medical Properties of.* This, which is regarded as the most potent of the mineral acids, is never taken internally in a concentrated state except by accident, or with the intention to commit suicide or murder. In such cases it acts as a violent corrosive poison, causing complete disorganisation of the tissues it comes in contact with, its course being obvious from the black and charred state of the parts. This effect it is thought to produce from its strong affinity for water, depriving the tissues of its elements, and leaving the carbon free. This peculiarity distinguishes poisoning by it from the other mineral acids. Notwithstanding the destruction of import-

ant organs, such as the stomach, immediate death rarely results from it, but the patient lingers sometimes for days, and in some cases recovers.

Sulphuric acid is sometimes employed in an undiluted state as a caustic application to the bites of rabid animals, or to destroy warts or portions of the eyelids in entropium and ectropium.

Taken internally, in a diluted but still strong state, it makes a powerful impression on the stomach, followed by an instantaneous sympathetic chill of the whole system: hence its power in checking hæmorrhage long before its particles can be received into the circulation and constringe the vessels by immediate contact with their sides. From the same cause it acts as a useful refrigerant in fevers and other inflammatory diseases when the animal temperature is too high. In many of the transient diseases of the skin attended with much heat and itching, a solution of sulphate of magnesia, with an addition of dilute sulphuric acid, quickly relieves them.

SULPI'CIA, a Roman poetess, of whose productions we possess only one Satire, consisting of seventy verses, which is usually called 'De Edicto Domitiani, quo Philosophos Urbe exegit.' The poem of Sulpicia is on the whole stiff, and shows little imagination. The best separate edition is that by J. Gurlitt, 'cum Commentariis C. G. Schwartzii,' 2 parts, 4to., Hamburg, 1819. It is also printed in the 'Anthologia Latina' of Burmann, and Wernsdorf, 'Poetæ Latini Minores.'

SULPI'CIUS RUFUS, P., was born in the year B.C. 124, and was ten years older than the orator Hortensius. In the year B.C. 94 he prosecuted C. Norbanus for the offence of majestas, under the provisions of the Lex Apuleia, a circumstance which brought him into notice. In the following year he was quæstor, and he served in the Social War as legate of Cn. Pompeius Strabo. He was tribunus plebis in the year B.C. 88, and supported the faction of Marius. Cicero heard many of his speeches during his tribunate, and thoroughly studied his style of oratory: 'He was,' says Cicero, 'of all the orators that I ever heard, the most dignified, and, if one may use the expression, the most tragic: his voice was powerful, sweet, and clear; his gesture and every movement graceful; and yet he seemed as if he were trained for the forum, and not for the stage: his language was rapid and flowing, and yet not redundant or diffuse.' (Cic., 'Brut.,' 55.) Sulpicius brought forward and carried a rogatio, by which the command of the Mithridatic war was transferred from Sulla to Marius. Sulla, who was then at Nola with his army, marched to Rome, of which he took possession. Twelve persons were proscribed, among whom were Marius and Sulpicius. Marius escaped; but Sulpicius was betrayed by his slave, and murdered in a villa near Rome. [SULLA.]

SULPI'CIUS, SERVIUS, the friend and contemporary of Cicero, was nearly about the same age as Cicero, and consequently was born about B.C. 106. He began his career as an orator, and might have attained the first place or have been only inferior to Cicero, if he had not directed his energies to the study of the law.

Servius filled several public offices. He was quæstor of the district of Ostia, curule ædile, and prætor for Quæstiones Peculatus. In the year B.C. 51 he was elected consul with M. Claudius Marcellus. After the defeat of Pompeius at Pharsalia, Cæsar made him governor of Achæa, where he was at the time when Cicero addressed to him one of his extant letters ('Ad Div.,' iv. 3). During the residence of Sulpicius at Athens, his former colleague Marcellus was assassinated in the Piræus. Sulpicius had him honourably buried in the gymnasium of the Academia, where a marble monument was erected to his memory. This tragical event is communicated by Sulpicius to Cicero in an extant letter, which is characterised by great simplicity. After the death of Cæsar he was sent by the senate, with L. Philippus and L. Piso, on a mission to Antonius, who was then besieging D. Brutus in Mútina, for the purpose of negociating with Antonius before the senate declared him an enemy to the state. He was then in bad health, and only just lived to reach the camp of Antonius, where he died, B.C. 43. Cicero pronounced a eulogy on his friend in the senate, and on his motion a bronze statue was erected to the memory of Servius. The fourth book of Cicero's letters ('Ad Diversos') contains his letters to Sulpicius and two letters from Sulpicius to Cicero.

Servius was an accomplished man, as well as a distinguished orator. As a jurist, he was, in Cicero's opinion, unrivalled; and this superiority he owed to his enlarged and liberal education. He wrote nearly 180 law treatises, many of which existed in the time of Pomponius, that is, in the time of Antoninus Pius. Servius is often mentioned in the 'Digest,' particularly by Alfenus; but there is no excerpt from his works in the 'Digest.' He founded a numerous school of jurists.

SULPI'CIUS SEVE'RUS, a Christian writer belonging to the end of the fourth and the beginning of the fifth century of our æra. He is generally supposed to have been born about the year A.D. 366, in Aquitaine, and was descended from a distinguished family. He first followed the legal profession, and gained great reputation as an orator; but after the death of his wife, who died at an early age, Sulpicius withdrew (A.D. 392) himself entirely from the world, and with a few friends led a retired and monastic life as a presbyter in Aquitaine. The time of his death is very uncertain; but the most probable opinion is that he died about A.D. 410, or soon after.

We possess of Sulpicius Severus four different works: 1. 'Vita Sancti Martini Turonensis,' which is written in the panegyrical style, and is full of miraculous events. 2. 'Historia Sacra,' or 'Chronica Sacra,' in two books. This is a brief history of religion from the creation down to the consulship of Stilicho and Aurelian (A.D. 400). 3. 'Dialogi Tres,' or it should rather be 'Dialogi Duo,' as the second dialogue is only a part of the first: the principal object of these dialogues is to describe the merits and virtues of the monks and hermits of the East. 4. 'Epistolæ,' the genuineness of some of which is very doubtful.

Notwithstanding the superstitious tone which pervades all the works of Sulpicius, they have a charm arising from their purity of diction which scarcely any other writer of this age possesses. There are many editions of the separate and the collected works of Sulpicius: such as those of G. Harnius, Leyden, 1647, &c.; and J. Vorstius, Berlin, 1668, &c. The best edition is that of Hieronymus de Prato, Verona, 1741 and 1754, 4to., which however does not contain the letters. His language is clear and concise.

SULTA'N, an Arabic word meaning a despotic ruler. It is the usual title of royalty among the Arabs and Turks. From Sultán the Italians have formed *Soldano*. The Spaniards retain *Sultán*.

SULZER, JOHANN GEORG, was born Oct. 16, 1720, at Winterthur, in the canton of Zürich. In 1736 he was placed at the gymnasium at Zürich, and on quitting it, three years afterwards, was ordained, and became a curate at Maschwanden. Ill health however soon compelled him to resign his clerical duties, nor did he ever reassume them. He now returned to his first and favourite studies of natural history, mathematics, and philosophy, and after residing about four years at Magdeburg as private tutor in the family of a wealthy merchant, received the appointment of professor of mathematics at the Joachimsthal gymnasium, Berlin, in 1747. On the death of his wife, in 1760, he quitted Berlin, and made a visit to his native country, where he recovered his wonted health and spirits, and where he first conceived the plan of his great work, the 'Theory of the Fine Arts.' The king having made him a professor at the newly-established Ritter-Academie, or military college, he returned to Prussia in 1763, where he remained till 1775, when he was advised to travel for the benefit of his health, then greatly impaired. He visited the south of France, Switzerland, and Lombardy, of which tour he kept a journal that was published shortly after his death. On his return to Berlin, his health, which had been considerably improved, again declined. He died February 25, 1779.

Great as was the distinction he acquired among his contemporaries in other and far different branches of knowledge, Sulzer's fame now rests chiefly upon his 'Allgemeine Theorie der Schönen Kunste,' a cyclopædia of literature and the fine arts, which was published in the years 1771-4. A second edition, in 4 large volumes, 8vo., with a supplement containing additions and corrections, was published 1792-4. Of Sulzer's other writings the principal are—'Moral Reflections on the Works of Nature,' Berlin, 1741; and 'Philosophical Pieces,' 1773-86.

SUM AND DIFFERENCE. There is no need to define the arithmetical meaning of these terms: a few words only are necessary to put them in their proper position in algebra. When quantities receive their proper algebraical signs, and those signs their interpretations, they are said to be added to a quantity when they are allowed to produce their effect, and subtracted when they are allowed to produce a contrary effect. And when quantities are put together so that each produces its simple effect, they are said to be added together; while any parcel which is either withdrawn, or compensated by others of equal and opposite effects, is said to be subtracted. We are not here discussing principles, but settling terms; and it is enough if the notions appended to them are proper foundations for clear and good deduction; and an additional advantage if common ideas and received phraseology are also suited, provided that nothing be assumed from such ideas and phraseology to the prejudice of the dependence of the deduction upon the prescribed definitions.

To form a just idea of the property of any person, we take the sums which he owes away from his assets; that is, we take away, not his debts, but sums out of his assets equal to his debts. To say that this is taking away his debts would not be correct; for taking away his debts would be merely destroying his liabilities, without making his assets answerable: a person who pays another's debts himself takes them away. A court of justice which decides a claim against the assets of any one annexes or puts on a liability; and this is in algebra *adding:* if the decision should be reversed on appeal, this liability to pay is removed, and this is in algebra subtracting. In the phrase 'to gain a loss,' the word 'gain' is used in the preceding sense of simple adjunction: if it were as common to talk of losing a loss, the verb to lose would be used in the sense of to remove or to get rid of; the other form of the word would be less of a bull, for to *loose* a loss would be to detach it. In a third form, the idiom is still plainer; to *release* [from] a loss would be precisely the idea of algebra, answering to subtracting a loss. Such things we mention, because by some persons those ideas of algebraical operation to which common idioms adapt themselves are easily received, as if the understanding of these common idioms were the same as that of the algebraical proposition; while other operations which have no such common phrases to illustrate them are difficulties.

SUMACH. [RHUS.]

SUMAROKOV, ALEXANDER PETROVITCH, was born at St. Petersburg in 1718, and was the son of a general officer. He was educated first at home, and afterwards in the Land Cadet Corps. The study of Corneille and Racine inspired him with a taste for dramatic composition; and at about the age of twenty-five he began to attempt it. His tragedies were at first performed at court before the Empress Elizabeth, and his success determined him to establish a permanent theatre in the capital. The result was, that a theatre was opened in 1756, under the patronage of the court, and Sumarokov appointed its director; whence he has been generally considered the founder both of the Russian theatre and the Russian drama. Among his tragedies, his 'Semira,' and 'Sinov and Truvor,' are his best and most original productions, notwithstanding they are not, like his 'Demetrius,' on the list of acting pieces. His great dramatic defect is his rigid adherence to the conventionalities and monotonous Alexandrine versification of the French stage. Sumarokov attempted not only every species of the drama, including operas, but almost every form of poetical composition. He versified the

'Psalms' in ten books, and wrote a vast number of odes, satires, epistles, fables, eclogues, elegies, sonnets, epigrams, songs, and other pieces, besides several in prose, including some historical and didactic ones, and his 'Dialogues of the Dead,' &c. The first complete edition of his works was published in 10 vols. 8vo., in 1787, ten years after his death, which happened at Moscow, Oct. 1, 1777.

SUMA'TRA is a large island in the Indian Ocean, and the most western of the Sunda Islands. The equator traverses the island nearly in the middle. Sumatra extends from 95° 20′ to 108° E. long., and from about 6° N. lat. to 6° S. lat. The general direction of the island is nearly N.W. and S.E., and its length rather exceeds 900 miles. The width south of 1° N. lat. is on an average 210 miles, but farther north not more than 140 miles. According to a rough estimate, its area is rather more than 160,000 square miles.

Coast-line.—The S.W. side of Sumatra is bounded by the Indian Ocean; the N. part stretches into the Bay of Bengal; to the N.E. it is divided from the Malay Peninsula by the Straits of Malacca. Between the S. extremity of these straits and the island of Banca, it is washed by the Chinese Sea. It is divided from Banca by the Strait of Banca. The coast south of that strait is washed by the Java Sea, and its southern extremity is separated from Java by the Straits of Sunda.

Sumatra terminates at the southern extremity on the Straits of Sunda in three promontories, including the bays of Lampong and Samangka; the latter is also called Keyser's Bay. The capes are called, from E. to W., Tanjong Toca, or Hog's Point, Tanjong Kamantara, and Tanjong China. The south-western coast from Flat Point to Manna, a distance rather exceeding 150 miles, rises with a steep ascent and generally to a considerable elevation, and presents but little anchorage for vessels. From Manna to Bencoolen, which are about 60 miles distant from each other, the coast continues to be high, and the cliffs descend with a gentle slope; but there are several harbours, of which Manna and Pool Bay are good. From Bencoolen to Tapanooly Bay, a distance of about 450 miles, the coast-line is alternately low and high, but the cliffs are of moderate elevation, and not often steep; along the coast are several harbours, of which that of Tapanooly is one of the finest in the world; and near the coast are numberless small islands. The coast continues to be lined with small rocky islands as far as Passage Island (2° 22′ N. lat.), north-west of the mouth of Singhel River. But north of Tapanooly Bay the coast-line is low. Between 3° N. lat. and 3° S. lat., a chain of larger islands stretches parallel to the coast from north-west to south-east, at the distance of 60 or 70 miles. At this part the surf of the sea is tremendous. The north coast, between Acheen Head and Diamond Point, is called the coast of Pedir, and extends about 150 miles: it is high and has many good anchorages. The north-eastern coast from Diamond Point to the mouth of the Rakan River, a distance of about 300 miles is low, but well defined. Between 1° 36′ and 35′ N. lat. there are three large islands, called Bacalisse, Padang, and Rankan, which are divided from Sumatra by Brewer's Strait, or Salat Panjang; this strait is from 1 to 5 miles wide, but navigable for large vessels. The remainder of the coast is for the most part low.

Surface.—The north-eastern side of Sumatra is a low and level plain; the south-western side is either mountainous or hilly. In a part of a mountain-range which lies between 4° 30′ and 6° S. lat., the watershed of the rivers, which flow eastward and westward, is at no great distance from the shores; and the rivers which descend from it to the Indian Ocean are only torrents, rushing down with incredible velocity during the rainy seasons, and destitute of water the remainder of the year. The country along the sea is a succession of high hills and narrow valleys, very little cultivated, and very thinly inhabited. The ridge which forms the watershed does not appear to rise to a great elevation. East of this range a much more elevated chain of mountains occurs at about 20 miles from the shores of the Indian Ocean. The central mountain-region may be considered as extending from 4° 30′ S. lat. to Tapanooly Bay, or 1° 40′ N. lat. It contains the highest ranges in the whole system. In few parts of the country of Bencoolen, or of the northern districts adjacent to it, could a tolerably level space of 400 yards square be marked out. The hollows and swellings are for the most part smooth and regularly sloping, so as to exhibit not unfrequently the appearance of an amphitheatre; and they are clothed with verdure from the summit to the edge of the swamp, with which many of the hollows are filled.

The northern part of the mountain-region, or that which extends from 1° to the most northern extremity of the island, contains a low plain, which lies along the Indian Ocean, and may be about 10 or 12 miles in width, and rather a hilly tract, which lies at the back of the plain, and is about 25 miles across. The plain is generally low and level. The hilly tract which extends along the north coast of Sumatra, from the valley of Acheen and Queen's Mountain on the west to Diamond Point on the east, a distance of about 130 miles, may be considered as an appendage of the mountain-region.

The *Great Plain*, which extends over the eastern and probably greater part of Sumatra, from Diamond Point to Tunjong Toca, presents only some variety along the coast, but as far as the interior is known it has a nearly uniform character. At about the middle of its coast-line, this plain is covered with water at spring tides, and thus converted into a large swamp; which is thickly wooded, and resembles in every respect the Sunderbunds in Bengal. It is uncultivated and nearly uninhabited, except by some straggling families on the banks of the rivers.

The interior of Sumatra is almost unknown to us. Among the mountains are some which reach an elevation of 15,000 feet.

The islands which lie near the north-eastern coast of Sumatra, within the Strait of Malacca, are uniformly low, and their soil appears to be

chiefly composed of alluvium. But the south-western coast of the island, between 3° N. lat. and 3° S. lat., is fronted by a chain of islands distant from it a little more than a degree. The chief of these islands are called Pulo Babi, Pulo Nias, Pulo Batu, Si Beeroo, Si Porah, North Poggy and South Poggy, Engano Island, and Pulo Bania. The largest island is Pulo Nias, 70 miles long by 18 in average width. Most of the islands are inhabited and cultivated. According to Marsden these islands, with the exception of Engano, whose inhabitants seem to belong to another race, are occupied by two nations, both of which belong to the race of the Malays, but differ considerably in stature and language. One nation, the Maruwis, are Mohammedans; the other, the Pagi, are pagans.

The most important of the rivers which drain the south-west coast, which are navigated by small craft to some distance from their mouth, are from south to north as follows:—the Kataun (3° 20′ N. lat.), the Ipoo (3° 5′ S. lat.), the Indrapura (2° S. lat.), the Tabuyong (40′ N. lat.), the Batang Tara (1° 25′ N. lat.), and the Sinkel. The last-mentioned river is much the largest on this coast, and its course considerably exceeds 100 miles. The rivers which rise in the mountain-region, and, traversing the eastern plain, fall into the Straits of Malacca and Banca, or into the China Sea, are larger and much better adapted to inland navigation. The chief of them are the Delhi, the Assahan, the Rakan, the Siack, the Kampar, the Indragiri. The Iambie River drains a great extent of country: according to the best maps, all the waters from the eastern part of the mountain-region between 1° and 2° 30′ S. lat. find their way to it. One of its upper branches rises in St. George's Lake, in the country of the Korinchi. The largest river of Sumatra is the Palembang, whose numerous upper branches originate in the mountain-region between 2° 30′ and 5° S. lat. The most southern of them brings down the waters of the large lake of Ranan. Most of the southern districts of the mountain-region send their goods to Palembang, and receive by this river those foreign articles which are consumed by the inhabitants. The Palembang near its mouth divides into several arms, reaching the sea with four mouths, which, with the intervening islands, occupy a space of more than 24 miles on the shores of the Strait of Banca.

Climate and Productions.—The great equability of temperature on all the coasts and lower parts of Sumatra is mainly owing to the circumstance of the island being comparatively narrow, for the wind which comes directly from the sea is not so warm as that which has passed over large tracts of land in tropical countries. On the west coast, south of the equator, earthquakes are frequently felt; but in general they are very slight, compared with those of South America and other countries. Marsden however mentions one which was experienced at Manna in 1770, and produced great changes in the surface of a considerable tract. Waterspouts are very frequent along the western coast.

Rice is cultivated in the lowest plains and in the elevated valleys of the mountain-range. No other grain seems to be cultivated, except maize. The most common esculent vegetables are different kinds of yams, both red and white; the St. Helena yam; sweet potatoes, common potatoes only in the more elevated districts; bredy, a kind of spinach; lobuck, or the Spanish radish; the large purple brinjall, or egg-plant; and many different sorts of beans, with white and green peas, and onions. The peas and onions are articles of export from the north-eastern coast to Penang and Singapore. Chili or capsicum, turmeric, ginger, coriander, and cummin-seed, are raised, especially on the western coast. Hemp is extensively cultivated, but only for smoking with tobacco. Tobacco is also grown, and is an article of export from the harbours on the north-eastern coast. Melons are raised on the plains, and sometimes attain an extraordinary size. Sesamum is cultivated for its oil; and the Palma-Christi, from which castor-oil is obtained, grows wild. The sugar-cane is only cultivated for chewing; no sugar is manufactured, but it is imported from Java. The plantations of betel-vines are extensive. Indigo and cotton are raised for domestic use only. The fruits are abundant, and include the cocoa-nut plantains, banana, the bread-fruit tree, jack-tree, mangusteens, durians, mango, different kinds of orange and lemon trees, especially the shaddock: the pine-apple, the jambo, the guava, the papaya, the custard-apple, the pomegranate, and the tamarind. European fruit-trees do not succeed. The pepper-plant is more abundant in Sumatra than in any other part of the globe. Coffee, sago, cloves, and nutmegs, are grown. The forests supply an inexhaustible variety of timber.

The most useful of the domestic animals is the buffalo, which attains an extraordinary size. It is generally used for agricultural purposes and as an animal of burden. Black cattle are not numerous, except on the coast of Pedir, where the plough is drawn by oxen. The horse is of a small breed, but well made and hardy. Those of the coast of Pedir are larger, and exported to the British settlements, where they are much valued. Sheep are few, and of a small size. Goats are numerous, but they are also small. A kind of wild goat found in the forests is much larger. The hog is of the Chinese breed. Few domestic animals are kept by the inhabitants of the great plain. Elephants, hippopotami, rhinoceroses, bears, and other wild animals, are numerous. Reptiles, insects, fish, and fowl, are also abundant.

Sumatra was once noted for its gold, and a considerable quantity is still exported. Tin occurs in several places on the great plain, but is very little worked, as large quantities are obtained in the Island of Banca, where it is got with less labour. Copper is found in the northern portions of the mountain-region (between 2° and 3° N. lat.), to the south-east of Analaboo, where it occurs in great abundance in an extensive tract: it contains gold, but is not much worked. Iron, sulphur, saltpetre, coal, and salt, occur in small quantities.

Inhabitants.—The inhabitants of Sumatra, with the exception of two or three small savage tribes, comprise the Acheenese, the Battas, the Malays, the Sumatrans, and the Lampongs.

The Acheenese occupy the most northern part of the island, and differ considerably from the other nations, being in general rather taller, stouter, and of a darker complexion. They are more active and industrious than their neighbours. In writing they use the Malay characters. They are Mohammedans.

The Battas occupy the sea-coast on the west side of the island. They are rather below the stature of the Malays, and their complexions are fairer. Horse-flesh they esteem the most exquisite meat, and for this purpose they fatten horses with great care. They have a language and written character peculiar to themselves. They have not embraced Islam, and are heathens: they acknowledge three deities as the rulers of the world.

The Malays occupy, to the exclusion of all other nations, the whole of the great plain from the river Rakan on the north to that of Masusi on the south, and also the shores north of the Rakan River as far as Timian. [MALAYS.]

The Sumatrans comprehend all the tribes that inhabit the west coast, from the river Tabuyong (40′ N. lat.) on the north to the river Padangguchi (4° 40′ S. lat.) on the south, and also occupy the mountain-region south of Menangcabau as far as 5° S. lat. They are rather below the middle stature. Their complexion is yellow, and much lighter than that of the Hindoos. They speak numerous dialects. They are for the most part heathens.

The Lampongs occupy the most southern part of the island, both the mountain-region south of the river Padangguchi and the plain south of the river Masusi. They have a strong resemblance to the Chinese, particularly in the roundness of the face and the form of the eyes; otherwise they do not differ in their persons from the Sumatrans. They are the fairest people in the island, and the women are the tallest and handsomest. Their language is a sort of mixed dialect.

According to the latest estimate, the population of Sumatra is stated at four millions. Though the data which we possess are few, and refer only to a small portion of the island, we think that this estimate is certainly not too high, and will eventually turn out to be much too low.

Districts and Towns.—Sumatra is partly subject to native sovereigns and partly under the sway and influence of the Dutch. The independent states lie on the north-eastern coast, along the Straits of Durian and Malacca, from 2° S. lat. to the most northern extremity of the island, and extend along the south-western coast as far as 2° N. lat. The remainder of the south-western coast, with a considerable part of the mountain-region, and the north-eastern coast as far north as 1° 30′ S. lat., is either immediately subject to the Dutch or governed by princes dependent on them. The independent states are Acheen, Siack, Indragiri, and Iambie on the coast, and that of the Battas in the interior.

1. *Acheen* is a small kingdom, under an hereditary monarchy. It is divided into provinces, further divided into 190 small districts. The chief town, Acheen, contains about 8000 houses, built of bamboo and rough timber, and raised from the ground on piles. The palace of the king is a strong structure; and there are several mosques. This town is the principal seaport, but there are several other ports, which are annually visited by some foreign vessels, and also carry on a considerable commerce in their own ships. On the coast between Acheen Head and Diamond Point, from west to east, are the harbours of Acheen, Pedada, Lawang, Pedir, Pakan, Selu, Burong, Sarong, Murdoo, Samalangan, Passangan, Junka, Teluksamoy, Chunda, Passy, and Curtoy, among which those of Pedir and Teluksamoy, next to the capital, are the most thriving and commercial. An important article of export from these ports is areca-nut. Along the south-west coast, from north to south, are the harbours of Pulo Ryah, Annalaboo, Senangkan, Tarang, Taddow, Tareepuli, Scimeyon, Qualla Battoo, Soosoo, Manghin, Labuan Haji, Telapow or Tallapow, Sama Dua, Tampat Tuan, Kavalat, Saluhat, Pulo Dua, Rambong, Sebadi, Tarooman, Ayam Dammah, Sinkel, at the mouth of the river of that name, and Tapoos. Considerable commerce is carried on at these ports with various countries.

The countries south of Diamond Point, which were formerly subject to the sultan of Acheen, but at present are governed by their own independent rajas, or sultans, as they are called, contain several ports, among which those of Langkat, Balu, China, Delli, Sardang, Batu Bhara, and Assahan are the principal. The sultans of the last four places are nominally dependent on the king of Siack. At all these ports there is much trading.

2. *Siack* is the largest state on the north-east coast, extending from the vicinity of the Assahan (3° N. lat.) to the river Kampar (0°), and being bounded by Indragiri to the south, by Menangcabau on the west, and by the Battas and Assahan on the north. The trading-places within this large tract are, from north to south, Bila, Panai; Tana Putch, Kubu, and Rakan, on the Rakan River; Bukit Batu on Brewer's Strait, Siack on Siack River, and Pulo Lawang on the Kampar River. The town of Siack is situated on the right bank of the river of the same name, about 65 miles from its mouth. It was a place of great trade thirty years ago, and though the trade has greatly decreased, owing to the continual internal wars, it still sends many trading vessels to Malacca and Singapore. Pulo del Lawang and other places on the Kampar River have lately risen into notice as trading-places on account of the great quantity of coffee which is annually brought by numerous small fleets, consisting of from 10 to 12 prahus, to Singapore.

3. *Indragiri* is a kingdom of small extent, comprehending only the countries on both sides of the river of that name, but extending to the very base of the mountain-region, where it borders on Menangcabau.

4. *Iambie* is the most southern of the independent states of Sumatra. The present capital, Tanapileh (chosen land), is situated a day's voyage above Old Iambie, which is 60 miles from the sea. The population is about 4000, among which there are fifty Arab families.

5. The country of the *Battas* occupies the interior of the island between 4° and 2° N. lat., and is only separated from the sea by a narrow tract of land, which is settled by the Malays and Acheenese, and governed by petty chiefs of those nations. It is a very fertile country, and is divided among many independent hereditary chiefs, who are frequently at war with each other.

The Dutch possessions extend perhaps over half the area of the island, and are divided into five regencies—Palembang, Lampong, Bencoolen, Padang, and Ayer Banghis. The first two are placed under the governor-general of Java, and the last three constitute the government of the west coast of Sumatra.

1. The Regency of Palembang has a native king as well as a Dutch regent. The chief town, Palembang, has a population of 25,000 and a large commerce. 2. The Regency of Lampong was formerly part of the possessions of the sultan of Bantam in Java, and passed with the other possessions of that monarch to the Dutch; the chief town is Mangala. 3. The Regency of Bencoolen contains the harbour of Croi, Kawur, Manna, Silebar, Bencoolen, Laye, Ipoo, and Moco-moco; the chief town is BENCOOLEN. 4. The Regency of Padang encloses the ancient kingdom of Menangcabau, whose population Raffles estimated at more than a million, and which a few years ago was subjected to the Dutch. The town of Padang, the residence of the governor of the west coast of Sumatra, and of the regent of Padang, is a small but well-built place. Ayer Adji is a small port. 5. The Regency of Ayer Banghis comprehends the mountain-region and the west coast between the equator and 2° N. lat. The two best harbours of Sumatra, the bays of Ayer Banghis and Tapanooly, are within these territories, and there is a good harbour also at Natal. On the Bay of Tapanooly are a few European commercial settlements.

Manufactures.—Nothing perhaps shows more clearly the advanced state of civilisation of the inhabitants of Sumatra than their manufacturing industry. The most important manufactures are those of iron and steel, which are carried to a considerable degree of perfection in Menangcabau, where iron has been worked from time immemorial. Silk and cotton fabrics, earthenware, and various works in metal, are among the best of the manufactures.

History.—Marco Polo notices Sumatra under the name of Java Minor. The name of Sumatra occurs first in the travels of Nicolo di Conti, who visited it before 1449. The Portuguese made unsuccessful attacks upon the coast in 1509, 1575, and 1582. The Hollanders appeared first on the north coast towards the close of the 16th century, and the English in 1602. The pepper-trade was the great object of these two nations: the Dutch formed a settlement at Padang in 1649, or shortly before, and the English at Bencoolen in 1685. The English afterwards pushed their commercial establishments southward to the vicinity of Flat Point, and erected others at Natal and around the Bay of Tapanooly; whilst the Dutch increased theirs in the intermediate space. But the Dutch had also got a firm footing in the southern districts of the island. Thus affairs remained till the year 1811, when the Dutch possessions, together with the island of Java, fell into the hands of the English. At the conclusion of the war, the Dutch regained all their settlements; and by subsequent negociation all the British settlements were given up to them. The Dutch have also obtained large additional districts from the natives.

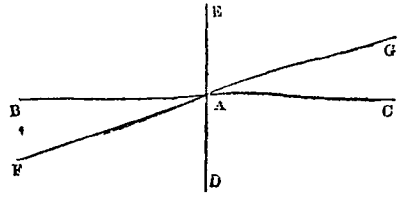
SUMMER-DUCK. [DUCKS.]

SUMY. [SLOBODE-UKRAINE.]

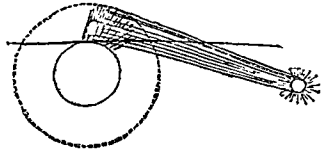
SUN (Latin *Sol*, Greek Ἥλιος, Hēlios). The sun, as the source of light and heat, and through them of the alternations of the vegetable world, is, in the highest secondary sense, the giver and sustainer of life; but this very importance ensures names to so many results of solar phenomena, that the present article is stripped of details, by their entering more appropriately into others.

The motions of the sun are in fact those of the earth, written in the heavens. If the diurnal motion of the earth were stopped, the sun would appear to move slowly among the stars, from west to east, at the rate of about twice its own diameter in twenty-four hours by the clock. This is the consequence of the orbital motion of the earth, which is communicated in appearance to the sun. If the earth's orbital motion were stopped, the diurnal motion continuing as usual, the sun would appear to move round daily, from east to west, as at present; but since there would then be no motion of that body among the stars, those stars which are at any one time hidden by the daylight would always be hidden, and the face of the heaven at any given hour of the night would be the same at all times of the year. The effect of the orbital motion of the earth combined with the diurnal motion is that of the solar day, or the interval between two meridian passages of the sun is a little longer than the sidereal day (about four minutes), or than the actual revolution of the earth; so that all the stars have their turn, and every star in the course of the year comes on the meridian at every period of the natural or solar day.

The great phenomena of day and night are attended with very different circumstances in different parts of the globe. We are not speaking now of the high polar regions, north and south, in which the sun never sets for days together, but of those parts of the earth in which there is actual appearance and disappearance of the luminary, or real day and night. Let us take the day of the vernal equinox as a specimen, when the sun is in the equator. If we take one fixed line to represent the horizon of different places, as BAC, the



sun will rise to a place on the equator so as to move along the circle DAE, and to come directly up from the horizon; while at a place near the pole it will move, relative to the horizon (still BAC), along the circle FAG. Now the first evidence which the sun gives of its approach is this (the diagram, though of very distorted dimensions, may be of use): Before it has risen above



the horizon of the place, so as to be visible, it can throw its rays into the atmosphere above the place, which atmosphere reflects something both of light and heat to the place itself. This period is called the twilight, and it is said that there is more or less of twilight as long as the sun is not more than 15° below the horizon: though certainly the twilight which saves candlelight does not last so long. But, be the number of degrees which are allowed to twilight more or less, it is obvious that at the equator, where the whole of the sun's way is made directly to or from the horizon, the intermediate period of twilight must be much shorter than at a place near the pole, where the motion towards the horizon is very oblique, instead of being all ascent, as before rising, or descent, as after setting. The consequence is well known: in the tropics, the warning is short, and soon after the light begins to break the sun makes its appearance, and it is broad and hot day; while after the setting the light as soon disappears, and it is dark night. With us, on the contrary, and still more in higher northern latitudes, there is a long warning of the approach of the luminary, before the sunrise, and a long remembrance of it after sunset.

Immediately after sunrise, the form of the luminary appears somewhat elliptic, the horizontal diameter being longer than the vertical one. This is the effect of refraction, which varies so rapidly near the horizon, that the upper end of the vertical diameter is less elevated than the lower end by a sensible quantity, while the two ends of the horizontal diameter are equally elevated. It must also be noted that both sun and moon appear larger when near the horizon: but this, as to the sun, is delusion, since, when measured with instruments, its apparent horizontal diameter is the same at all parts of the day. It is true that both bodies, when in the zenith, are nearer to the spectator than when in the horizon, by what may be called without error a semidiameter of the earth: the moon is near enough to show the effect of this in instrumental measurements of its diameter; but it is not so with the sun.

Before looking at what we know of the physical appearances of the sun, its distance from the earth must be mentioned, to which we may add at once the other elements of its orbit. Its equatorial horizontal parallax, at its mean distance, is 8″.5776, and its apparent semidiameter 16′ 0″.9. It is then distant from the earth by 24,000 semidiameters of the earth, or about 95,000,000 of miles. Its diameter is 111¼ times as great as that of the earth, or upwards of 880,000 miles; and its bulk is 1,300,000 times as great as that of the earth. But its mass, as determined from its action on the planets, is only 355,000 times as great as that of the earth; whence its average density is only one-quarter of that of the earth. But this last result takes into the body of the sun all that is seen of it: if the surmise, presently to be mentioned, of its having a luminiferous atmosphere of considerable extent, be well founded, the real body of the sun may have as much density as the earth or moon. It revolves on its axis in 25½ of our mean solar days; according to Delambre, in 25.01154 days: the axis being inclined to the ecliptic at an angle of 82½°.

The ecliptic is the circle in which the sun appears to move, in common language. In strictness however the earth does not move round the sun in a true plane, though it does so very nearly.

The appearance of the sun is simply that of a ball of intense light, such as the human eye cannot bear, unless a hazy atmosphere or a dark glass be used as a screen. This light is so strong, that the brightest flames which human art can produce, when held before the sun, disappear, and ignited solids become dark spots. A very small portion of the rays collected into one spot is sufficient to melt metals. On examining the face of the sun with a telescope (of course with a dark glass before the eye), two circumstances are observed. The disc is not uniformly bright. 'The ground is finely mottled,' to use the words of Sir John Herschel, 'with an appearance of minute dark dots, or *pores*, which, when attentively watched, are found to be in a constant state of change. There is nothing which represents so faithfully this appearance as the slow subsidence of some flocculent chemical precipitates in a transparent fluid when viewed perpendicularly from above; so faithfully indeed, that it is hardly possible not to be impressed with the idea of a luminous medium intermixed, but not confounded, with a transparent and unluminous atmosphere, either floating, as clouds in our air, or pervading it in vast sheets and columns like flame, or the streamers of our northern lights.'

The other circumstance which is noticed on the sun's disc is the existence of black spots, by the regular motion of which the rotation of the body on its axis has been determined. These spots are of various irregular shapes, and are always surrounded by a border or penumbra, not so dark as the spot. They are of various sizes, from the least visible to the twentieth part of the sun in diameter. In their neighbourhood are frequently observed streaks on the disk more numerous than the rest, called *faculæ*, in which streaks spots frequently begin their appearance. The spots themselves alter in size, and gradually vanish, lasting various times, from a few days to six or seven weeks; the borders approaching each other in a manner which calculation shows must answer to hundreds of

miles a day. Various theories have been invented to account for them, but none which has any appearance of probability, except that of Sir W. Herschel. He supposes that the sun has an atmosphere of greater density and depth than that of the earth; and that above this atmosphere, or else mixed with the higher strata of it, is another atmosphere of self-luminous clouds, of very variable depth, sometimes showing the lower atmosphere uncovered, which last reflects the light of the luminous atmosphere above it. A spot on the sun is a portion of the body of the sun itself, laid bare by some commotion which removes both atmospheres, or the greater portion of them: the penumbra round the spot, its never-failing attendant, arises from the ridges of the lower atmosphere, which form the banks of the opening. The faculæ and the general mottled appearance of the sun arise from the luminous atmosphere having waves or ridges. From some measures of the light of different parts of the sun, Herschel thought that the non-luminous atmosphere reflects a little less than one-half the light it receives from the luminous atmosphere, and the solid body of the sun less than one-tenth. He also supposed that the presence of spots and other disturbances indicated a large formation of heat and light in the sun, and was a prognostic of hot weather and fine seasons. This he imagined he had verified by such comparisons as existed of the state of the sun at different times with the prices of wheat immediately following: he found that, as far as his data went (and he gives a proper warning as to their insufficiency), the price of wheat always rose when the sun was without spots, and fell when they began to re-appear. We have not heard of any extensive attempt to verify or refute this theory; but so far as the hypothesis of the two atmospheres is concerned, it is one of high probability. We could hardly ask for a likely result of such a combination which does not actually make its appearance. If it be correct, the sun may very possibly be a globe habitable by living beings, perpetually illuminated by its upper atmosphere, the lower atmosphere preventing too much of either light or heat from reaching them.

But as to the process by which this enormous manufactory is kept up, no theory gives the means of forming even a conjecture on the subject. Not but that conjectures have been formed. For example, it has been thought that comets carried supplies of the necessary material. That comets may occasionally fall into the sun is very possible; but as far as our knowledge of them goes, it would be as reasonable to expect that the steam-engines in our factories should be kept in repair by throwing their own cinders upon them, as that comets should supply what is needful for the maintenance of the solar rays.

SUN, ECLIPSE OF THE. The phenomena of an eclipse of the sun resemble those of the moon in one respect only, namely, that the body of the luminary disappears. In all other respects there is so great a difference, both in the cause of the phenomenon and its attendant circumstances, that it is a pity one term, eclipse, should be used in senses so different. In the first place, the disappearance of the moon arises from the earth intercepting the light which she ought to receive, while that of the sun is the consequence of the moon coming between the sun and the earth. The body of the moon is never absolutely hidden, and is even slightly visible through a telescope during the darkest eclipse; but the body of the sun is really hidden by the intervention of the opaque substance of the moon. Again, the phenomena of an eclipse of the moon are the same for every point of the earth at which they are visible: the beginning, middle, and end of the phenomenon happen at the same instant of absolute time everywhere, and the same portion of the moon is hidden from all the earth at the same instant. But in a solar eclipse, it entirely depends upon the position of the spectator whether there is any eclipse at all; and of two persons at different parts of the earth, at the same instant, one may see the sun totally eclipsed, while the other may, by the brightness of the sun's rays, not know that the moon is almost close to him. A screen held before a candle may be an eclipse of the candle for one person in the room, but not for another, on account of their difference of place: this is an illustration of the solar eclipse. A ball thrown into a dark corner may be invisible to all the persons in a room at the same time: this is the same illustration of a lunar eclipse.

It is hardly necessary to state that eclipses of the sun are frequently wholly partial, that is, not total for any one moment to any one part of the earth. Sometimes, though the eclipse be central, it is not total, on account of the moon not being near enough to hide the whole of the sun; in which case part of the sun is seen as a bright ring round the part hidden by the moon, and the eclipse is called annular.

An appearance of a surprising character has been often observed in total and annular eclipses of the sun, as soon as the moon begins to leave or approach the internal border of the sun. In the former case the separation is not always instantaneous, but threads of black appear to connect the edge of the moon and sun, 'as if the edge of the moon were formed of some dark glutinous substance which by its tenacity adhered to certain points of the sun's limb, and by the motion of the moon was thus drawn out into long threads, which suddenly broke and wholly disappeared.'

. . . 'The moon preserved its usual circular outline during its progress across the sun's disk, till its opposite limb again approached the border of the sun, and the annulus was about to be dissolved. When, all at once (the limb of the moon being at some distance from the edge of the sun), a number of long, black, thick, parallel lines, exactly similar in appearance to the former ones above mentioned, suddenly darted forward from the moon and joined the two limbs as before; and the same phenomena were thus repeated, but in an inverse order. For, as these dark lines got shorter, the intervening bright parts assumed a more circular and irregular shape, and at length terminated in a fine curved line of bright beads (as at the commencement), till they ultimately vanished, and the annulus consequently became

wholly dissolved.' The preceding is from Mr. Baily's paper on the solar eclipse of 1836 ('Mem. Astron. Soc.,' vol. x.), in which an account will be found of preceding appearances of the same kind. Several other observers saw the same thing in the same eclipse. No account whatever can be given of the reason of this remarkable appearance.

SUN-BIRDS, *Cinnyridæ*, a family of birds of brilliant plumage, living upon the juices of flowers, and representing in the Old World the *Trochilidæ*, or *Humming-Birds* of the New Continent and its islands.

Cuvier, in defining his genus *Cinnyris*, states that the species composing it have the bill long and very slender, with the edge of the two mandibles finely serrated; and the tongue, which can be protruded from the bill, terminating in a fork. They are, he observes, small birds, and the plumage of the males glitters in the season of love with metallic colours approaching in splendour that of the humming-birds, which they represent in this respect in the Old Continent, where they are found principally in Africa and the Indian Archipelago. They live, he adds, on flowers, from which they pump the juices. Their nature is gay, and their song agreeable. Their beauty makes them much sought after in our cabinets; but as the plumage of the females and that of the males during the interval between the seasons of love is entirely different from its nuptial brilliancy, it is difficult to characterise the species. ('Règne Animal.')

Cinnyris, in Cuvier's arrangement, stands between *Melithreptus* and *Arachnothera*.

For some interesting observations on the *Cinnyridæ* and other allied families of the *Tenuirostres* or *Suctorial Birds*, as *Trochilidæ*, *Promeropidæ*, *Meliphagidæ*, and *Nectariniadæ*, see Vigors on the 'Natural Affinities of Birds,' in 'Linnæan Transactions,' vol. xiv. [CREEPER; MELIPHAGIDÆ.]

Mr. Swainson, in his 'Classification of Birds,' divides the *Cinnyridæ* into the following genera:—*Melithreptes*, *Cinnyris*, *Anthreptes*, *Nectarinia*, and *Dicæum*.

Mr. G. R. Gray regards the Sun-Birds as constituting part of his family *Nectariniidæ*, which family he makes the second of the tribe *Tenuirostres*.

As examples of this beautiful group, we may instance, *Cinnyris chalybeia* (the Lesser Collared Creeper), *Anthreptes Javanica*, *Nectarinia cyanocephala* (Indian and Australian Islands), and *Dicæum hirundinaceum* of Australia, figured and described by Mr. Gould in his great work on the 'Birds of Australia.'

Lesser Collared Creeper (*Cinnyris chalybeia*).

SUN-DIAL. Up to a comparatively recent period the science of constructing sun-dials, under the name of Gnomonics, was an important part of a mathematical course. As long as watches were scarce, and clocks not very common, the dial, which is now only a toy, was in actual use as a timekeeper. Of the mathematical works of the 17th century which are found on book-stalls, none are so common as those on dialling. All that is now necessary is to give some idea of the principles on which such instruments are constructed, as an illustration of a leading fact in astronomy. If a person were to place a staff in the ground, so as to point either vertically or otherwise, and to watch its shadow at the same hour, on different days at some intervals from each other, marking its direction at each day's observation, he would in all probability find that the direction of the shadow, the hour being always the same, varied from day to day. He might however find that the shadow was always in one direction at the same hour, and this might happen in two different ways. First, he might by accident fix the staff in a direction parallel to that of the earth's axis, in which case the direction of the shadow would always be the same at the same hour, at all times of the year, and for every hour. Secondly, having fixed the staff in a position not parallel to the axis of the earth, he might happen to choose that particular hour, or interval between two hours, at which the shadow of a staff in that one direction always points one way. But if, as is most likely, he were to fix the staff in a direction which is not that of the earth's axis; and if, as is again most likely, he were to choose any time of observation but one, the shadow would certainly point in different directions at different periods.

A sun-dial consists of two parts: the *style*, which is the staff above mentioned, usually supplied by the edge of a plate of metal, always made parallel to the earth's axis, and therefore pointing towards the north; and the dial, which is another plate of metal, horizontal or not, on which are marked the directions of the shadow for the several hours, their halves and quarters, and sometimes smaller subdivisions.

SUN-FISH, a fish so named on account of its almost circular form and shining surface. This most remarkable fish belongs to the family *Gymnodontidæ*, and genus *Orthagoriscus*. As in others of the family, the sun-fishes have the jaws provided with an ivory-like substance, divided internally into laminæ, which represent the teeth, these being united as it were into a solid mass. The opercula are small, and the branchiostegons rays are five in number. The body is compressed; the pectoral fins are of moderate size; the dorsal and anal fins, both of which are long, are united with the caudal, and thus surround the hinder portion of the fish, which appears as if it had been truncated. The Short Sun-Fish (*Orthagoriscus*

mola, Schneider) has been found on various parts of the British coast. When however observed in our seas they have generally, Mr. Yarrell remarks, appeared as though dead or dying, and floating along on the side, presenting the broad surface of the body to view. Dr. Neill says, of one which was brought to him, that the fishermen informed him that, when they observed it, it was swimming along sideways, with its back fin frequently above water. It seemed to be a stupid dull fish. It made little or no attempt to escape, but allowed one of the sailors to put his hands under it and lift it fairly into the boat. The sun-fish has been generally mentioned as remarkable for its phosphorescence, but this specimen did not exibit that phenomenon so distinctly as a haddock or a herring.

This fish is said to feed on sea-weeds: its body, viewed sideways, presents nearly a circular figure; the jaws are slightly produced; the eye is rather small, and the pectoral fin is small and rounded. Occasionally this species attains the length of four feet, and weight of upwards of three hundred pounds. The skin is very rough, and chiefly of a silvery colour.

The Oblong Sun-Fish (*Orthagoriscus oblongus*, Schneider), usually found at the Cape of Good Hope, is said also to have occurred on the British coast. Dr. Turton describes the body of the oblong sun-fish as being nearly three times as long as it is deep.

A third species of the present genus, of small size, is sometimes met with in the Atlantic: it is the *Orthagoriscus spinosus* of Bloch.

SUN-FLOWER, the English name of a genus of plants called *Helianthus*, from ἥλιος, the sun, and ἄνθος, a flower. Two reasons have been assigned for giving the plants of this genus this name: first, the resemblance of the large disk and ray of their flowers to the sun; and second, the tendency of these flowers, in a stronger degree than in other plants, to present their face to the sun. From this circumstance the French *Tournesol*, Italian *Girasole*, and English Sun-Flower are names given to them.

H. annuus, Annual Sun-Flower, is an herbaceous annual plant, the largest of the genus. It is indigenous in Mexico and Peru. It was early introduced into Europe after the discovery of America, and has since been very generally cultivated in gardens, on account of its very large and handsome yellow flowers. The plant however in Europe never attains the height nor the flowers the size they do in their native soil and climate. The albumen of the seeds of this plant contains a large quantity of oil; and it has been proposed to cultivate it for the sake of obtaining this oil, which is very palatable, and might be used for the table. *H. multiflorus* (Many-Flowered Sun-Flower) is not so high a plant as the last, nor are its flowers so large. It is a native of Virginia. *H. tuberosus* (the Tuberous Sun-Flower, or Jerusalem Artichoke), a native of Bengal, was introduced into Europe at the Farnese Garden at Rome, whence it was originally distributed. The roots are composed of a number of oblong tubercles, very large and fleshy, reddish outside and white within, resembling a potato. These tubers when cooked form a good substitute for potatoes, and by some are even preferred. Many animals eat them with avidity.

Some of the species secrete a resinous juice, which is found to exude from the various organs of the plant. This is most observable in the *H. thurifer*, in which the resinous matter runs down the stem. This is sometimes observed to occur in the flowers of *H. annuus*.

SUNDA ISLANDS is a term generally applied to the western and larger portion of the Indian Archipelago. They are divided into two groups, the Greater and the Lesser Sunda Islands. The Greater Sunda Islands [BORNEO, CELEBES, JAVA, and SUMATRA], with their dependencies [BANCA, BILLETON, and MADURA], are noticed under separate heads.

The Lesser Sunda Islands are situated between 5° and 11° S. lat., and between 114° and 135° E. long. Although these islands were early visited by the Portuguese, who formed small settlements on some of them, and although the Dutch East India Company afterwards kept a small establishment on many of them, they were almost entirely unknown in Europe until a few years ago. They consist of four large groups, which, from west to east, are called the Timor Islands, the Serawatti Islands, the Tenimber Islands, and the Aroo Islands. The term Lesser Sunda Islands is frequently applied to the Timor Islands alone.

The *Timor Islands*, so called from the largest of the islands, extend from 114° to 127° 30′ E. long., and comprehend the greater part of the islands and the larger islands of the whole chain. Between 114° and 119° it consists of three large islands, Bally, Lombok, and Sumbawa, which lie west and east of one another. But between 119° and 127° the islands constitute a double row, of which the northern, lying between 8° and 9° S. lat., comprehends Comodo, Flores, Solor and Adinara, Lomblen, Pantar, Ombay, and Wetter. The southern row forms a curve towards the south, advances nearly to 11° S. lat., and consists of the islands of Sumba or Sandalwood, Savu, Rotti, Simao, and Timor. The straits which separate these islands from one another are often navigated by vessels bound to or from China. The chief of these straits are those of Lombok (40 miles long by 12 to 30 wide), Allas (50 miles long by 12 wide), and Sapy (40 miles long by 12 wide).

The island of *Sumbawa* extends from west to east about 180 miles, with an average width of 40 miles. Two large bays, Sallee Bay and Bima Bay, enter deeply into the island from the north. Along the southern shores extends a mountain-range, which penetrates far into the interior. The remainder of the island is generally hilly, but a few of the elevations rise considerably above the rest. The most remarkable of them is Tumbora Peak, a volcano, whose eruption in 1815 is one of the most terrible on record: the island suffered dreadfully; whole towns and villages were destroyed by the ashes, of which a vast mass was thrown out, and which were carried as far as Surabbaya in Java, and to the islands of Macassar and Amboyna. There are many teak-trees on the island. The chief animals are horses and buffaloes. The

island is divided into six petty states, Bima, Sangar, Tumbora, Papekat, Sumbawa, and Dimpo, which are independent of each other, but united together by a defensive alliance. The Dutch have a few trading ports.

In Sapy Strait is the island of Gilibanta, near which are those of Goonong Apee, and Comodo. East of these are the straits of Mangerye, and of Flores, with the island of Flores. [FLORES.] Next occur the islands of Sebrao, Solor, Lomblen, Pantar, and Ombay. All of these are very high and bold, especially the last mentioned three. A peak on Lomblen is visible at the distance of 50 miles. On Pantar are three summits, the highest of which is an active volcano. The inhabitants of Sebrao are Christians. Solor is dependent on the Dutch of Coopang, and sends to that place large quantities of wax and fish-oil. The inhabitants of the coast are Mohammedans. The inhabitants of Lomblen, Pantar, and Ombay are numerous, and mostly if not entirely belong to the Haraforas.

The island of Sandalwood, the native name for which is Sumba, lies south of the Strait of Sapy and of the island of Flores, being divided from the latter by a strait about 36 miles wide. It is about 100 miles long by 50 wide. The surface is rather high and undulating. The inhabitants are Haraforas. The Dutch once had settlements there. Between Sandalwood and Timor are the islands of Sáwu and Rotti. Sáwu is a hilly island, about 20 miles long by 10 wide; it is governed by four chiefs, dependent in some degree on the Dutch. Rotti extends about 60 miles long by 20 wide. The surface is a succession of low hills and narrow valleys; the soil is very stony, but productive. The rivers are few and small, and the supply of water generally scanty. The inhabitants, about 50,000, differ from those of the neighbouring islands in person and in language. They are governed by eighteen chiefs, who acknowledge the supremacy of the Dutch, and an interpreter is stationed on the island. Some of the chiefs profess Christianity, but the majority are pagans.

The island of *Timor* is the largest of the Lesser Sunda Islands, being 300 miles long from south-west to north-east, and on an average 45 miles wide. A chain of mountains runs through the middle of the island from one extremity to the other. All the rivers are small, and descend so rapid a declivity that none of them are navigable beyond the tidal point. The soil in many places is fertile, but the greater part of the interior has not been visited by Europeans. The principal objects of agriculture are maize, millet, rice, pulse, sweet potatoes, and cotton. Wild animals are numerous. Gold is found in several of the rivers, both in lumps and in small particles, and some of the lumps weigh two ounces. The island is divided among many petty chiefs, who for the most part are either dependent on the Dutch or on the Portuguese. Coopang Bay contains Fort Concordia, the principal settlement of the Dutch. The trade of this place is considerable, and is said to amount annually to rather more than 1,200,000 Spanish dollars. The Portuguese have three settlements on the northern coast, Batoo-Gede, Dilli, and Manatatoo.

To the north of Timor is the island of *Wetter*, which is about 65 miles long, and 20 miles wide on an average. It is a high rocky mass, with very little commerce.

The *Serawatti Islands*, which are situated between 9° and 6° S. lat., and between 127° and 131° E. long., consist of two rows of islands, which extend between Timor and Wetter on the west and Timorlaut on the east. The southern series consists, besides several smaller islands, of which the greater number are uninhabited, of seven islands of moderate size, which, from west to east, are as follow:—*Kisser*, 18 miles in circumference; *Lettu*, a little larger than Kisser; *Moa*, the largest of the three; *Lakor*, *Locan*, and *Serawatti*, three smaller islands; and *Baba*, 30 miles long by 10 wide. Most of these islands are moderately fertile; and those which are so contain a few Dutch settlements, where trade is carried on. The northern series of the Serawatti Islands contains, besides a few smaller islands, four larger islands, Roma, Damma, Nila, and Seroa. The last-mentioned three contain active volcanoes, which constitute the connecting link between the volcanoes of the Sunda Islands and those of the Malaccas. *Roma* is about 24 miles in circumference, and has an anchorage on the south and another on the north-west coast. The inhabitants have made more progress in civilisation than those of the other islands, except Kisser.

The *Tenimber Islands* are situated between 6° 30′ and 8° 20′ S. lat., and 131° and 132° 20′ E. long., and consist of one large island, Timorlaut, and three of moderate size, Cerra, Larrat, and Vordate, and a great number of smaller islands. *Timorlaut* is about 90 miles long by 40 broad; the other islands are much smaller. The inhabitants of the Tenimber Islands differ materially from those of the other groups; they are well made, and their complexion is not so dark; their habits exhibit a higher civilisation.

The most eastern group of the Lesser Sunda Islands are the *Arroo Islands*, which are situated between 5° 20′ and 7° S. lat. and between 34° and 35° E. long.

The Lesser Sunda Islands are evidently inhabited by two, if not three, different races of men. Those which lie west of Sapy Strait seem to be entirely peopled by the Malay race; but farther west the great bulk of the population has features materially different from the Malay, as is proved by their darker colour, their frizzled hair, and the form of their limbs.

SUNDA, STRAIT OF, is the most frequented thoroughfare between the Indian Ocean and the China Sea, and is generally navigated by vessels which proceed from the Atlantic to the islands of the Indian Archipelago and the eastern countries of Asia. It extends between 5° 40′ and 6° 50′ S. lat., and between 104° 55′ and 106° E. long., from south-west to north-east. Its northern shores are formed by the southern coast of Sumatra, and its south-eastern by the western parts of Java. Its length is about 70 miles. The strait is wide towards the Indian Ocean, but rather narrow where it opens into the Java Sea. The two headlands which form its western entrance, Flat Point

in Sumatra, and First Point in Java, are nearly 55 miles from each other. A row of islands, four in number, lies across the strait in an oblique direction between First Point in Java and the peninsula of Raja Bassa, and divides it into five straits. These are Prince's Island, Crockaton, Pulo Bessy, and Pulo Sebooko; and the minor straits which separate them are Behouden, the Great Channel, and three others of less importance. Nearly in the centre of the eastern and more narrow portion of the strait is the island called Thwart-the-Way, which is more than four miles long from south to north, and moderately elevated, but surrounded by a sea inconveniently deep for anchoring. The channel between this island and Sumatra, called Zutphen Channel, is much frequented in the north-west monsoon by ships from the China Sea bound westward. At other seasons the preference is given to the southern channel, between Thwart-the-Way and the coast of Java, which is called Bantam Channel.

Though this strait is the maritime high-road which connects the most populous and civilised countries of the globe, there is no town on its shores, not even a large village, though there are several places which afford safe and convenient anchorage. The most important and most frequented are Raja Bassa Road, on the eastern side of Lampong Bay in Sumatra, and Anger and Mewen Bay in Java.

SUNDAY. [WEEK.]

SUNDERBUNDS. [HINDUSTAN, vii., 209.]

SUNDERLAND, a municipal borough and parliamentary borough, 303½ miles N. by W. from London by railway through York and Durham, is situated at the mouth and on both sides of the river Wear. The largest part of the town is on the south side, and comprises the parish of Sunderland and the townships of Bishop-Wearmouth and Bishop-Wearmouth-Pans. On the north side of the river are the townships of Monk-Wearmouth and Monk-Wearmouth-Shore.

Monk-Wearmouth was a place of some note in the Anglo-Saxon and Anglo-Norman period. The first notice of Bishop-Wearmouth is in a charter of Hugh Pudsey, bishop of Durham, towards the close of the 12th century, granting privileges to the burgesses similar to those of the burgesses of Newcastle. The borough is in the charter termed Weremue (Wearmouth), but it appears from its very origin to have had also the name of Sunderland. Towards the close of the reign of Elizabeth the shipping of coal began, and the town of Sunderland increased considerably. In 1634 it received a new charter of incorporation from Bishop Morton. The parish of Sunderland, which was formed in 1719 by detaching a part of Bishop-Wearmouth, occupies the point of land at the south side of the mouth of the Wear, and, with the exception of the town-moor, is covered with houses of considerable antiquity. There is one street, broad and handsome, communicating with the High Street of Bishop-Wearmouth, and lined with good houses: the other streets are merely narrow lanes, very densely peopled. Bishop-Wearmouth was some time since a distinct town from Sunderland, but the progress of building has united them. The newer part of Bishop-Wearmouth adjoining Sunderland has good streets and excellent houses: the wealthier classes reside here. Bishop-Wearmouth is rapidly increasing, several new streets having been recently built. Bishop-Wearmouth-Pans comprehends a small but densely-peopled part along the bank of the river: it has glass-houses and iron-works for the manufacture of articles required by the shipping. Monk-Wearmouth-Shore is immediately opposite to Sunderland and a part of Bishop-Wearmouth: it has a dense population, but few of the higher class. Monk-Wearmouth adjoins Monk-Wearmouth-Shore, but lies back from the river. On the bank of the river, half a mile higher up than Monk-Wearmouth, and extending inland, is Southwick, which is included in the parliamentary borough.

The river is crossed by an iron bridge of one arch, erected near the close of the last century. The abutments are piers of nearly solid masonry, 24 feet in thickness. The arch is of iron, and forms the segment of a large circle, having a span of 236 feet; the height above low-water is 60 feet to the spring, and 94 feet to the centre of the arch, so that ships of 300 tons pass under it very readily by lowering their top-gallant masts. The superstructure is of timber planked over, with flagged footpaths and iron balustrades.

Sunderland church is a spacious modern brick building, with a square tower. There are two or three other churches in Sunderland. The church of Bishop-Wearmouth was very much altered in the early part of the present century; the chancel is ancient, and has a fine east window. There are three episcopal chapels in Bishop-Wearmouth. Monk-Wearmouth church is a mutilated and irregular building, but has, especially in the tower, some very ancient features. There is also an episcopal chapel in Monk-Wearmouth. There are a considerable number of places of worship for dissenters.

The town contains a custom-house, an excise-office, and an exchange (the last comprises a merchants' walk, commercial room, news-room, auction-mart, and justice-room), a theatre, an assembly-room, and an athenæum. There are water-works and gas-works on a large scale. A new cemetery has been formed in a deep ravine contiguous to the town of Bishop-Wearmouth, called the Rector's Gill.

The preservation and improvement of the port and harbour of Sunderland are entirely owing to the exertions of commissioners who have been appointed under successive acts of parliament for levying certain dues and applying them to the cleansing and improving of the harbour. These works, and particularly the construction of piers on both sides of the mouth of the river, have had so great an effect in improving the port that ships drawing from 15 to 18 feet of water can now enter and depart from the harbour with great safety. There is a wet-dock comprising nearly 8 acres, with a tidal basin attached to it, on the north side of the river near the entrance of the harbour. In July, 1850, a very large wet-dock was opened on the south side of the river. The

works extend from the river to Hendon Bay, but the southern outlet is not yet (Aug. 1850) completed. First is the tidal harbour of 2½ acres opening from the river; next the half-tide basin (2½ acres), leading from it to the great dock of 20 acres, near the south end of which are the two jetties, one already occupied by four staiths for the shipment of coals, the rest of the accommodation being intended for general traffic. The widths of the entrances between the tidal harbour and the half-tide basin are respectively 45 and 60 feet, and that between the half-tide basin and the great dock 60 feet. In the great dock the depth in the middle at high-water of ordinary spring-tides is 24 feet, and at neap-tides 20 feet 6 inches. Besides the site recovered from the sea, now forming the dock, an area of upwards of 25 acres of land has in like manner been gained from the sea to the eastward of the dock, which will be found exceedingly valuable and available for many useful purposes. The coal traffic is brought by the branch railway to the staiths on the jetties. The access to the dock for other traffic is from the foot of the High Street along the western side of the docks, and to the eastern side by moveable pontoons over the two entrances from the tidal harbour to the half-tide basin. The dock is probably the cheapest, as well as one of the best, that has ever been constructed, the entire cost, up to Dec. 31, 1849, not exceeding 219,498*l.*; while it is calculated that the formation of the southern outlet, which will comprise a most extensive half-tidal basin and entrance, will not cost more than 60,000*l.* more.

The principal manufactures of Sunderland are of bottle and flint glass, anchors, chain-cables and other iron goods for ships, and cordage. Ship-building is carried on to a greater extent than in any other seaport of the British Empire. On Dec. 31, 1849, there were 90 ships building, the aggregate burthen of which was 29,210 tons. The number of ships belonging to the port in 1849 was 155 (44,333 tons). The net amount of customs for the year 1846 was 60,154*l.* 9*s.* 8*d.*

About 140 firms are engaged in business in connection with ship-building, as chain-cable manufacturers, sail-cloth manufacturers, anchor and ship-smiths, rope, sail, mast, block, or pump makers; besides ship-owners, brokers, and chandlers. Some of the ropewalks are on a very large scale. Brick-making, coal-mining, and the quarrying of grind-stones, are carried on in the neighbourhood; and there are copperas-works, brass-foundries, potteries, hat-manufactories, lime-works, timber-yards, saw-mills, flour-mills, tan-yards, and breweries. The town is however more important from its commerce than its manufactures. In shipping coal it is exceeded only by the port of Newcastle, and recently perhaps by Stockton.

The export of lime is another principal branch of trade: also the export of glass and grindstones. The imports are timber and iron from the Baltic; butter, cheese, and flax from Holland; and a variety of goods brought coastwise. A considerable fishery is carried on.

The municipal borough is divided into 7 wards, and is governed by 14 aldermen (of whom one is mayor) and 42 councillors. The parliamentary borough, which returns 2 members, comprises the parish of Sunderland and the several townships of Bishop-Wearmouth, Bishop-Wearmouth-Pans, Monk-Wearmouth, Monk-Wearmouth-Shore, and Southwick: population, 52,818.

SUNDERLAND, HENRY SPENCER, first EARL OF (of that name), was born in 1623, and was the eldest son of Henry, second Baron Spencer of Wormleighton. While still a minor he married the Lady Dorothy Sydney, daughter of the Earl of Leicester, and sister of Algernon Sydney, the Saccharissa of the poet Waller. On the breaking out of the civil war, and the erection of the royal standard at Nottingham, Aug., 1642, Lord Spencer repaired thither, although by no means desirous of setting the prerogative above the law. He distinguished himself by his gallantry at Edgehill, Oct. 23, 1642. The following year he was raised to the title of Earl of Sunderland; but he fell at the (first) battle of Newbury, Sept. 19, 1643.

SUNDERLAND, ROBERT SPENCER, second EARL OF, the only son of Henry, the first earl, was probably born in 1641 or 1642. In the latter end of 1671 he was nominated ambassador to Spain. In 1672 he went to Paris in the same capacity, and he was one of the three plenipotentiaries appointed to proceed to Cologne in the following year, when England and France were engaged in a war with the Emperor, Spain, and Holland, to open negociations for a general peace, which however proved abortive. In 1678 Sunderland was again sent ambassador to France; but on the change of government at home in the beginning of the following year, he was recalled, and made secretary of state. At first he and Lords Essex and Halifax united in opposing Shaftesbury on the question of excluding the Duke of York. This triumvirate however did not last long. Before the end of the year Sunderland had shaken off both the others: the kingdom was then governed by a new junta, consisting of himself, Lord Hyde, and Godolphin. To this date is to be assigned the commencement of Sunderland's relation with the Prince of Orange, afterwards King William. He and Godolphin now supported the exclusion; but after the dissolution of the last of the exclusion parliaments, in March, 1681, another change of government threw Sunderland, with the rest of the popular members of the administration, out of office. In Jan., 1682, however he was recalled and remained in power during the rest of the reign of Charles II.; and notwithstanding his exertions in favour of the exclusion bill, when James became king he was not only retained in office, but acquired a greater ascendancy in the administration than ever.

He now found a new patron in the Queen, to whom he professed to give himself entirely up. When the Marquis of Halifax was turned out for refusing to vote for the repeal of the Test Act, Sunderland was, in Dec., 1685, declared president of the council, still retaining his place of secretary. It is worthy of notice that all this success in political life was achieved by Sunderland without the faculty of public speaking: he scarcely ever opened his lips to express more than a simple

assent or dissent, either in parliament or at the meetings of the cabinet.

Throughout James's unhappy reign the principal direction of affairs was in the hands of Sunderland and Father Petre, those two constituting what was called the secret council. At last Sunderland, about the end of 1687, turned Roman Catholic. It has been supposed, with some show of truth, that this was a device to gain confidence, and effect the overthrow of the king. To make matters even however, Lady Sunderland took to professing a hotter Protestantism than ever. James at last either came to suspect the good faith of his minister, or thought to lighten the crazy vessel of the state by throwing him overboard. He was dismissed Oct. 28, 1688.

On the arrival of the Prince of Orange, Sunderland went over to Amsterdam, whence he and his wife wrote to the Prince, claiming his protection on the ground that they had all along been in his interest. On March 23, 1689, Sunderland published at London a defence of his conduct on similar grounds, in the form of a letter to a friend, which is printed in the 'History of the Desertion,' pp. 28–33, and in Cogan's 'Tracts,' vol. iii.

Sunderland, who had been excepted from the act of indemnity, was obliged to remain abroad about two years, and then, not a little to the surprise of the public, he returned, to be taken into favour by the new king, April 24, 1691. For some years he did not take any public office, but it was understood that he was William's principal adviser. The admission of the Whigs to a share in the government, in 1693, was well known to be his doing. Towards the end of 1695 Sunderland was made lord chamberlain, and, according to the usage of that day, took his seat at the council-table. He continued to direct affairs as the head of the government for about two years longer. At last, in the end of 1697, he resigned his office, and retired into private life, 'not only against the entreaties of his friends,' says Burnet, 'but even the king's earnest desire that he would continue about him.'

He spent the remainder of his life at Althorpe, where he died Sept. 28, 1702.

SUNDERLAND, CHARLES SPENCER, third EARL OF, the second son of Robert, second earl, was born in 1674. He was returned to the House of Commons for Tiverton at the general election in 1695; and he sat for the same place in the three succeeding parliaments, which met Dec., 1698, Feb., 1701, and Dec., 1701. The death of his father made him a peer about six months after the accession of Anne. He had become Lord Spencer, by the death of his elder brother, before 1690; but in his father's lifetime the republican opinions which he then entertained caused him to treat the title with contempt; and accordingly he was called 'Charles Spencer.' His first public employment was his appointment as envoy extraordinary and plenipotentiary to the court of Vienna in 1705, on the accession of the Emperor Joseph. Some years before this he had married (for his second wife) a daughter of the Duke of Marlborough; and this connection led to his being selected by the Whig section of the ministry, in Dec., 1707, as one of the secretaries of state. Sunderland retained his office till June, 1710, when his dismissal, without any reason being assigned, was the first intimation of the complete break-up of the ministry which immediately followed. When George I. came over, in Sept., 1714, most persons looked to Sunderland, who was considered the head of the Whig party, as the future secretary of state; but that office, through the contrivance of Walpole, was given to Lord Townshend, while Sunderland was obliged to put up with the lord-lieutenancy of Ireland, which he considered a kind of exclusion and banishment. It is probable that his relationship to the Duke of Marlborough, who was personally disliked by George I., had much to do with his being thus kept in the background. In August, 1715, soon after the death of the Marquis of Wharton, he was made lord privy seal; but this place still gave him little or no share in the direction of affairs, and did not remove his disgust. He now sought support for himself, and the means of annoying and weakening his opponents, from all quarters, and the result was, that Lord Townshend, after much manœuvring and intriguing by the faction in whose hands the king was, and much indecision on the part of his Majesty himself, was removed. Sunderland was in the first instance appointed treasurer of Ireland for life, resigning his office of lord privy seal to the Duke of Kingston; and finally, in April, 1717, a complete reconstruction of the ministry was effected, Sunderland and his friend Addison being secretaries of state, the former also holding for some months the presidency of the council, which he eventually resigned to the Duke of Kingston.

On March 5, 1719, the famous bill for limiting the number of peerages was first brought into the House of Lords. The bill was abandoned that session; and when, on the motion for its committal in the following session, Sunderland found himself beaten—for Walpole's eloquence and influence had procured the triumphant majority of 269 to 177 against the ministerial project—he deemed it his best policy to enter into an alliance with the potent commoner. Accordingly, in June, 1720, Walpole and his friend Townshend were both reinstated in the government, the former as paymaster of the forces, the latter president of the council. This proved a fortunate arrangement for Sunderland. In the beginning of the following year came the investigation by the House of Commons into the transactions connected with the South Sea scheme, in which Sunderland, with others of the ministers, had been deeply involved; and the secret committee had reported that of the fictitious stock distributed by the directors of the company, with the object of influencing or bribing the government and the legislature, 50,000*l.* had been given to Sunderland. Walpole exerted himself with great ardour among his friends in the House to gain votes on behalf of Sunderland, and the minister was acquitted by a majority of 61 votes, 233 against 172.

Notwithstanding his acquittal, it was found impossible to retain him in office, and on April 3 he was succeeded by Walpole as first lord of the

treasury. Sunderland however still retained the most unbounded influence over the king, and Coxe asserts, on the evidence of private papers, that he not only tried to undermine the cabinet, but even intrigued with the Tories, and made overtures to Bishop Atterbury, the agent of the Pretender. It also appears that he had contrived a plot for the political annihilation of Walpole, and he might possibly have succeeded in effecting the downfall of his rival, but he was suddenly arrested by death, April 19, 1722.

Lord Sunderland, who associated much with the wits and literary men of his day, was one of the members of the famous Kit-Kat Club, and was also one of the noblemen who, about the beginning of the last century, directed their efforts towards the collection of early literature.

SUNDGAU, a district in the south of Alsace, now included in the French department of Haut-Rhin. Belfort or Béfort was its chief town.

SUNIUM. [ATTICA.]

SUNNITES. [SHIITES.]

SUPERFICIES, the Latin form of the word surface, used in the sense of surface, and sometimes of area. The quantity of an area is called its superficial content, as distinguished from linear content or length, and solid content or bulk.

SUPERIOR, LAKE. [CANADA.]

SUPERSE'DEAS, the name of a writ used for the purpose of superseding proceedings in an action; in bankruptcy it is the writ used for the purpose of superseding the fiat.

SUPPLY. [DEMAND AND SUPPLY.]

SUPPURATION. [INFLAMMATION.]

SUPRALAPSARIANS, the name given to a portion of the Calvinistic party, who held that all the occurrences which take place on the earth have been from eternity the subject of a special decree of God: that God decreed to create man solely for his own glory, and to display his glory in the eternal happiness of some and the damnation of others: that this decree respected not merely the end, but all the means, direct or indirect, by which that end was to be wrought out; and that sin, the fall of man, and the introduction of evil into the world, were decreed by God to happen as necessary means to the end proposed, and God therefore so constituted man, and placed him in such circumstances that he could not but fall.

The other party were called *Infralapsarians*. They considered the decrees of God for fixing the eternal state of man as equally eternal and unchangeable, but they maintained that God did not create man in order that he might fall, but left him free to act for himself; and, though foreseeing that he would fall, did not interfere to prevent him, but decreed that the consequences of this foreseen fall should result in increased glory to himself, and the eternal happiness of the greater part of men.

SUPREMACY is a term used to designate supreme ecclesiastical authority; and is either papal or regal. Papal supremacy is the authority exercised until nearly the middle of the 16th century by the pope over the churches of England, Scotland, and Ireland, as branches and integral parts of the Western or Latin church, and which continues to be exercised to some degree over that portion of the inhabitants of those countries who are in communion with the church of Rome.

The papal supremacy was abolished by the legislatures of the three kingdoms in the 16th century. In order to ensure acquiescence in that abolition, particularly on the part of persons holding offices in England and Ireland, an oath has been required to be taken which is generally called the Oath of Supremacy, a designation calculated to mislead, it being in fact an oath of *non*-supremacy; since, though in its second branch it negatives the supremacy of the pope, it is silent as to any supremacy in the king. This oath is therefore taken without scruple by persons who are not Roman Catholics, whether members of the Anglican church or not. The form of the oath was established in England by 1 Wm. & Mary, c. 8. Under this and many former statutes, all subjects were bound to take the oath of supremacy when tendered; but by the 31 Geo. III., c. 32, s. 18, no person since the 24th June, 1791, is liable to be summoned to take the oath of supremacy, or prosecuted for not obeying such summons; and Roman Catholics, upon taking the oath introduced by that act, s. 1, in which the *civil* and *temporal* authority of the pope are abjured, may hold office without taking the oath of supremacy.

Henry VIII. was acknowledged as supreme head of the church of England by the clergy in 1528. This supremacy was confirmed by parliament in 1534, by the statute of 26 Hen. VIII., c. 1.

SURABAYA. [JAVA.]

SURAT, a city on the western coast of Hindustan, in the presidency of Bombay and province of Gujerat, stands on the south bank of the Tapty, in 21° 12′ N. lat. and 72° 50′ E. long. The Tapty falls into the Gulf of Cambay about 18 miles west from the city. Surat is about 120 miles north from Bombay, direct distance: it is situated in a fertile country, with numerous villages and farms in the neighbourhood.

The city of Surat is in the form of a semicircle; the Tapty is the chord, near the centre of which is a small fortified castle. The city is surrounded by a wall about six miles in circuit, in good repair, with semicircular bastions, and with battlements. Surat, though a large city, is by no means a handsome one. The streets are narrow, winding, unpaved, in the wet season muddy, and in the dry season dusty. The houses are generally high, and are mostly constructed of a framework of timber (often bamboos) filled up with bricks or sun-dried mud; most of the upper stories project over the lower ones. The houses however of some of the principal merchants are of stone, and are large and well built, but there are no public buildings worthy of notice as specimens of architecture, and indeed the only structure which has much of interest attached to it is the hospital for aged and diseased animals: it occupies a large piece of ground surrounded by high walls, and is divided into compartments or wards, with every arrangement requisite for the comfort of the different classes of animals, as horses, oxen, sheep, goats, &c. It is an establishment founded by the Jains, and is

richly endowed by them. The residence of the nawâb is modern, and not at all striking. There is a neat English church, which was consecrated by Bishop Heber in 1825. A large and picturesque burying-ground, outside the city, contains numerous tombs of former servants of the East India Company. These tombs are constructed in the Mohammedan style of architecture, and some of them are 150 or 200 years old; that of Sir George Oxenden, for size and solidity, is worthy of one of the founders of the British empire in India.

The population of Surat in 1796, when its prosperity had confessedly declined, was at least 600,000. It is now much reduced, the greatest part of its commerce having been transferred to Bombay. The inhabitants at present probably do not exceed 150,000, perhaps not 100,000. They consist of Hindoos, who are mostly Jains, of Mohammedans, of Parsees, and of Armenians, Jews, and various other races, besides Europeans. The Parsees are the most flourishing part of the population. They are of Persian origin, followers of Zoroaster, and of course fire-worshippers, who, when driven out of Persia by the Mohammedans, found an asylum at Surat, where they have continued ever since. Heber thought that half the houses in the city belonged to the Parsees. There are also great numbers of religious mendicants in this city and its neighbourhood, Fakeers, Yogies, and Gosaens, who enforce charity from the superstition both of Hindoos and Mohammedans.

The Tapty at Surat is a wide river: but the navigation is dangerous, from shifting sand-banks, even to boats; and large vessels are prevented from entering it by a bar, and therefore anchor in the Surat Roads, or Swally Roads, so called from the small sea-port of Swally, at the mouth of the river, where the ships discharge and take in their cargoes. The boats which navigate the river are generally of 30 and 40 tons, half-decked, with two masts and two large latteen-sails. The river opposite the city is brackish: water for domestic purposes is raised by oxen from wells, and there are also large tanks to collect the rain.

The imports to Surat are chiefly from Arabia, Bombay, and Brazil, and consist of grain and other articles of food, piece-goods, raw materials to be worked up into manufactures, and bullion. The exports are mostly manufactures of Surat and the neighbouring districts, raw cotton, and a few other articles of native produce. The vessels are chiefly British, Arabian, and Portuguese.

Surat is a place of such antiquity as to be mentioned in the ancient Sanscrit poem 'Râmâyana.' After the conquest of Hindustan by the Mohammedans, it was the chief port at which they embarked on their pilgrimage to Mecca; and when the Europeans first discovered the passage by the Cape of Good Hope was the greatest place of maritime commerce on the continent of India, being in immediate communication with the richest provinces in the Mogul Empire, and conveniently situated for trading not only for the western coast of that continent, but with the gulfs of Persia and Arabia. The Portuguese were the first Europeans that reached the western coast of India by sea: after establishing themselves at Calicut, Goa, and Damaun, they began to trade with Surat about 1561. An English factory was established at Surat by treaty with the governor of Ahmedabad, in Dec., 1612, and confirmed by an imperial firmaun in 1613. Surat soon afterwards became the chief station of the East India Company on the west coast of India. It was the chief seat of government under the East India Company till 1686, when the government was removed to Bombay.

SURD. This word has been used to signify an irrational arithmetical or algebraical quantity since the time of the introduction of algebra into Europe, though why any term formed from *surdus* was used in such a sense is not known; perhaps it was the supposed translation of an Arabic term.

SURESNE. [SEINE.]

SURETY. A surety is one who undertakes to be answerable for the acts or omissions of another, who is called his principal. Such undertaking must be in writing, and it may be either by bond or by simple writing. A contract is not binding unless made upon some sufficient consideration; but in the case of a bond this consideration is inferred from the circumstances of deliberation incident to its execution as a deed. When the undertaking is not by bond, it is necessary that the consideration should appear upon the face of the written instrument, or be necessarily implied from the terms of it, and that the instrument should be signed by the party who becomes the surety. The instrument by which the surety becomes bound, when it has reference to civil matters, is generally called a guarantee, and ordinarily consists of an undertaking to become answerable for the payment of goods furnished to the principal, or for his integrity, skill, attention, and other like matters. In such cases the consideration expressed would probably be the furnishing of the goods to the principal, or his employment by the party guaranteed.

If a person gives a security by way of indemnity for another, and pays the money, this money may be recovered in an action against the principal. But in no case is the surety entitled to more than an indemnity from his principal.

If more persons than one become sureties for the same principal, they are called co-sureties. If one of them has paid the whole of the debt due from the principal, he may recover in an action of assumpsit from his co-sureties the amounts for which they were respectively liable. A court of equity will also interfere to regulate the proportions due from each.

SURETY OF THE PEACE is the acknowledging of a recognisance or bond to the king, taken by a competent judge of record for keeping the peace. [RECOGNISANCE.] Such recognisance may be obtained by any party from another on application to a magistrate, and stating on oath that he has just cause to fear that such other 'will burn his house, or do him a corporal hurt, as by killing or beating him, or that he will procure others to do him such mischief.' The fear must be of a present or future danger. Upon the neglect or refusal of the party so summoned to enter into the recognisances demanded, he may be committed to prison by the magistrate for a specified period, unless he sooner complies.

SURFACE. [SOLID, &c.; SUPERFICIES.]

SURFACE OF THE EARTH. If the stratified and unstratified rocks which compose the skeleton of the earth were laid bare to our view, the aspect of the globe would be far more rugged than it is now. The soil, gravel, clay, peat, and other substances, which by their accumulation mask the features of the interior rocks, constitute a peculiar class of geological phenomena.

Soil is often supposed to be merely the disintegrated parts of the subjacent rocks; and this is sometimes really the case. But the soils which cover clays, limestones, and sandstones are seldom of this simple origin. The basis of these soils may be generally derived from the subjacent strata, but they usually contain foreign ingredients. We may often understand the cause of these admixtures by considering the effect of rains and currents of water on the sloping surface of the earth. These effects arrive at a maximum in particular vales and plains, into which many streams enter after flowing over strata of different kinds. In such vales the soil is in fact a mixture of calcareous, argillaceous, and arenaceous parts. To watery agency we may also ascribe many even extensive accumulations of gravel and sand which lie along the sides of valleys and in hollows of hills, or on the slopes of mountains. The beds of old lakes, often consisting of layers of shelly marl, with bones of existing or extinct quadrupeds, and the surfaces of silt which lie along the present and ancient æstuaries of rivers, and often conceal buried forests and subterranean peat, present no difficulty as to their origin; for the processes by which peat grows and trees are buried, and marshy land is saved from the sea, and lakes are filled up, are at this day in action. [ALLUVIUM; DILUVIAL FORMATIONS.]

SURGEONS, COLLEGE OF. The present College of Surgeons of England had its origin in the Company of Barber-Surgeons, which was incorporated by royal charter in the first year of Edward IV. By this charter of 1 Edward IV. the barbers practising surgery in London, who had before associated themselves in a company, were legally incorporated as the Company of the Barbers in London. Their authority extended to the right of examining all instruments and remedies employed, and of bringing actions against whoever practised illegally and ignorantly; and none were allowed to practise who had not been previously admitted and judged competent by the masters of the company.

In spite of this charter many persons practised surgery independently of the company, and at length associated themselves as members of a separate body, and called themselves the Surgeons of London. In the 3rd year of Henry VIII. it was enacted 'that no person within the city of London, or within seven miles of the same, should take upon him to exercise or occupy as a physician or surgeon, except he be first examined, approved, and admitted by the bishop of London or by the dean of St. Paul's for the time being, calling to him four doctors of physic, and for surgery other expert persons in that faculty.' All who under this act obtained licence to practise were of course equally qualified, whether members of the company of barbers or not; and in the 32nd year of Henry VIII. the members of the latter company, and those who had incorporated themselves as the Company of Surgeons, were united in one company, by the name of Masters or Governors of the Mystery and Commonalty of Barbers and Surgeons of London.

In the 18th year of George II. an act was passed by which the union of the barbers and surgeons was dissolved, and the surgeons were constituted a separate company; and in the 40th year of George III. a charter was granted by which it was confirmed in all the privileges which had been conferred upon it by the act of George II. By this charter the title of the company was altered to that of the Royal College of Surgeons in London. Under this charter it was governed by a council or court of assistants, consisting of twenty-one members, of whom ten composed the court of examiners.

A new charter was granted to the College of Surgeons in the 7th year of Victoria, by which it is declared, that the name of the college shall henceforth be The Royal College of Surgeons of England; and that a portion of the members of the said college shall be fellows thereof, by the name of The Fellows of the Royal College of Surgeons of England. The number of members of council is to be increased from 21 to 24, and all future members are to be elective, and to be elected periodically, in the manner prescribed by the charter. There are various special provisions as to the eligibility of fellows. There are to be ten examiners of surgeons for the college, and the present examiners are to continue for life; and all future examiners are to be elected by the council, either from the members of the council, or from the other fellows of the college, or from both of them; and all future examiners of the college shall hold their office during the pleasure of the council. The charter contains other regulations, and confirms the powers of the college and the council, except so far as they are altered by the charter. 'The Bye-Laws and Ordinances of the Royal College of Surgeons of England' contain the regulations as to the candidates for the fellowship, for the examination of candidates for the fellowship, admission of fellows, and election of members of council. By section 1, it is required that every candidate for the fellowship, among other certificates, shall produce a certificate, satisfactory to the court of examiners, that he has attained a competent knowledge of the Greek, Latin, and French languages, and of the elements of mathematics. The subjects of examination for the fellowship are Anatomy and Physiology on the first day, and Pathology and Therapeutics and Surgery on the second day. In the anatomical examination the candidate must also perform dissections and operations on the dead body in the presence of the examiners.

SURIANA'CEÆ, a small natural order of plants formed by Lindley, and placed in the Gynobasic group of Polypetalous Exogens. This genus was named after Joseph Donat Surian, who was a physician and botanist of Marseille.

SURINAM. [GUYANA.]

SURRENDER. '*Sursum Redditio* properly is a yielding up of an estate for life or years to him that hath an immediate estate in reversion or remainder, wherein the estate for life or years may drown by mutual agreement between them.' ('Co. Litt.,' 337 b.) A surrender and a release both have the effect of uniting the particular estates with that in reversion or remainder; but they differ in this, that whereas a release generally operates by the greater estate descending on the less, a surrender is the falling of the less estate into the greater.

As to surrender of copyholds, see COPYHOLD.

A surrender may be made of letters-patent and offices to the king, to the intent that he may make a fresh grant of the same right; and a grant of the second patent for years to the same person, for the same thing, causes a surrender in law of the first. (10 'Rep.,' 66.)

SURREY, an inland county of England, is bounded N. by Middlesex, from which it is separated throughout by the river Thames, E. by Kent, S. by Sussex, W. by Hampshire, and N.W. by Berkshire. The length E. to W. is 39 miles; the breadth N. to S. is 25 miles. The area is 759 square miles. The population in 1841 was 582,678.

Surface and Geology.—The part of the county which lies north of a line drawn from the Kentish border near Beckenham, leaving Croydon a little to the south, and passing by Leatherhead, and from thence to the Hampshire border near Ash, leaving Guildford a little to the south, belongs, with some exceptions, to the London Clay formation. The district occupied by this formation is comparatively low; but forms the line of elevations extending on the south side of London, from New Cross near Deptford, by Nunhead, Denmark Hill, Herne Hill, Brixton Hill, Clapham Rise, Wimbledon Common, and Richmond Hill. It also forms the hills running southward along the Kentish border from New Cross by Forest Hill, Sydenham, Penge Common, and Norwood. None of these are of much elevation, though some of them command extensive prospects. The hills about Norwood are 389 feet above the level of the sea.

North of the hills which extend from New Cross to Battersea the London Clay is covered by alluvium; and it is probable that the greater part of this flat was, antecedently to the Roman period, overflowed by the river at every high tide, and formed an extensive marsh, which was gained from the river by embankment. Along the bank of the river also, between Putney and Richmond, the London Clay is covered by alluvium.

The range of high grounds, Esher Common, Cobham Common, St. George's Hill, Woking Heath, Pirbright Common, and Ash Common, which extend with slight interruption from the neighbourhood of Kingston to the Hampshire border, including St. Ann's Hill, Shrubs Hill, and the other hills west of Chertsey and Bagshot Heath, and the high ground of Chobham Ridges between these two ranges, are all formed of the siliceous sand and sandstone belonging to the upper marine formation, which here covers the London Clay. The highest elevation does not exceed 463 feet. This formation presents a poor, hungry, unimproveable sand; and hence extensive wastes are allowed to remain, notwithstanding the proximity of the metropolis and the consequent impulse to cultivation. South of the boundary-line of the London Clay the Plastic Clay crops out, and occupies a long narrow district extending across the country from the Kentish to the Hampshire border.

South of the Plastic Clay the chalk range of the North Downs rises. These downs extend from Kent across the county into Hampshire, interrupted only by the depressions through which the rivers Mole and Wey pass, and by a depression near Farnham. The breadth of the chalk district is greater on the eastern side of the county, and the downs there attain their greatest elevation. Botley Hill (880 feet), above Titsey, is the highest point. The breadth of the chalk district here is about four miles. Box Hill, near Dorking, overlooks the depression through which the Mole passes. Between Dorking and Guildford the range of the downs gradually narrows; and between Guildford and Farnham it forms a remarkable narrow unbroken ridge, above six miles long and about half a mile broad, called the Hog's Back. The downs rise again beyond Farnham just on the border of Hampshire, into which they extend.

From beneath the south escarpment of the North Downs the chalk marl and green-sand formations crop out. They occupy the valley which extends at the foot of that escarpment all through the county, and which valley east of Reigate is called Holmesdale; but as the formations extend southward from the chalk they rise into hills, of which Leith Hill (993 feet) is the highest point in the county, and indeed in this part of England, and they extend to Hind Head Common (923 feet), on the Hampshire border.

The rest of the county, comprehending the whole of the southern border, except a very small part west of Haslemere, is occupied by the Weald Clay and Iron-Sand formations. The latter only just appears at the south-eastern corner of the county. The Weald Clay occupies the broad valley at the foot of the green-sand hills, and in some places forms the lower part of the south side of the hills.

Rivers.—The county is included in the basin of the Thames, except three very small portions; two south of the green-sand hills, which are drained by streams flowing into the Arun, and a third in the south-east corner of the county, which belongs to the basin of the Medway. The Thames, which forms the northern boundary, is navigable throughout for small craft, and up to London Bridge for sea-borne vessels. Those of its tributaries which belong to Surrey are the Bourn Brook, the Wey, the Mole, the Hog's Mill River, the stream which joins the Thames above Putney, and the Wandle.

The Bourn Brook rises near Bagshot, and flows by Chobham and Addlestone into the Thames below Chertsey: its whole length is about 14 or 15 miles.

The Wey rises near Alton in Hampshire, and

flows N.E. 9 or 10 miles to the border of Surrey, which it enters S. of Farnham, whence it flows with many bends by Godalming to Guildford, where it passes through the chalk ridge. It then flows N. by E. to Weybridge, below which it enters the Thames. The whole length of the Wey is about 41 miles, for about 18 of which it is navigable.

The Mole rises in the northern part of the county of Sussex near Hand Cross, and flows N. about 5 miles to the border of Surrey, which it enters near Horley. It then flows N. and N. by W. to Dorking. From Dorking the Mole winds N. past Leatherhead to the Thames at East Moulsey, opposite Hampton Court. Its whole course may be estimated at 42 miles. It is not navigable in any part. In penetrating through the chalk range of the North Downs at the foot of Box Hill near Dorking, the Mole is subject to be occasionally absorbed by the spongy and porous soil through which it flows.

The Hog's Mill River rises in a copious spring in the village of Ewell, and flows N.W. 7 miles into the Thames at Kingston. It is not navigable. The stream which joins the Thames near Putney rises at the foot of Banstead Downs near Cheam: its length is almost 10 miles: it is not navigable. The Wandle rises near Croydon, flows 3 miles W. to Carshalton, then turns and flows 8 miles N.N.W. by Mitcham, Merton, and Wandsworth, into the Thames: its course is only 11 miles, and it is not navigable.

Canals and Railways.—The canals are the Grand Surrey Canal, the Wey and Arun Canal, and the Basingstoke Canal. The London and South-Western Railway passes through the county, and sends off branches to Guildford and Reigate, where a communnication is formed with the London and Brighton Railway. From Guildford a line passes by Godalming direct to Portsmouth, and there are lines from London to Richmond and Staines, with smaller branches. There are also the London and Greenwich Railway, and the commencement of the North Kent Railway.

Agriculture.—The climate of this county is favourable for corn and grass. Along the Thames and the other rivers of the county the air is soft and mild. Where the ground rises into gravelly hills, or lies on the range of chalk which runs along the centre of the county, it is keener. The soil varies greatly in different districts. The richest is that which lies along the banks of the rivers, consisting chiefly of a deep alluvial loam. On this soil, in the neighbourhood of London, are some of those extremely productive and highly-cultivated market-gardens which supply the metropolis with fruit and vegetables. The immense quantity of manure which is annually laid on the land so occupied, and the deep trenching and digging which are repeated at short intervals, have converted the whole surface, to the depth of three feet or more, into a rich black vegetable mould. On this soil are raised the best and earliest culinary vegetables, which so rapidly succeed each other that five or six different crops are sometimes gathered from the same ground in one year. There is another naturally rich black soil, which appears in small detached portions along the foot of the chalk hills. The quantity of this soil however is small. The next in fertility is a hazel loam, with a considerable portion of calcareous earth in its composition, which is found on the northern side of the hills about Cobham, Ripley, Woking, and Horsell. The well-known hop-grounds in the neighbourhood of Farnham are mostly on a similar soil.

The most extensive tract is that of the Weald Clay, which is a soil with a smaller mixture of siliceous sand than most clays. This weald extends into Sussex and Kent, and occupies most of the southern parts of the county. In its natural state this soil is of little value, and can only be rendered productive by very complete draining, and by correcting the tenacity by chalk or gravel, where they can be found at hand, which however is seldom the case. The Weald is generally low and flat; where it rises into hills the soil is more fertile. In the northern portion of the county extending towards Hampshire is a large tract of sandy loam of various qualities, some of which remains to this day in the state of heath and commons. There are some sandy loams of a better quality between the barren soil known by the name of Bagshot Sand and the chalk hills, as about Esher, Dorking, and Reigate: about Godalming it becomes of a very good quality, resting upon a sandstone. The poorer sands rest chiefly upon a yellow ferruginous gravel.

The tops of the chalk hills are either covered with a short pasture, as downs, or, where the soil is deeper over the chalk, it is mostly under the plough.

Surrey is a favourite county for the residence of men of fortune. It possesses many beautiful sites, and the views from some of the hills are very extensive, such as Richmond Hill, St. Ann's Hill, Cooper's Hill, and Leith Hill. The villas within a short distance from London are very numerous, but few of them have more than a small quantity of pasture-land and pleasure-ground attached to them. Within a certain distance from London the larger properties have been mostly subdivided, and their value greatly increased from the competition of purchasers. Most of the farms are smaller than is consistent with a wealthy tenantry. Provided a man has a sufficient capital, he can cultivate 500 acres as easily as 200, and can afford to use better and more improved implements. A lower profit per acre will remunerate him; while the small farmer requires all his profits to maintain his family.

The system of fallowing to clean the land is almost generally adopted on the heavy soils. The course of crops differs on the different soils. On all light soils the Norfolk four years' course is generally adopted, with occasional modifications. On the chalk sainfoin is sown with advantage, and broken up after five or six years. On the lands which are too wet for turnips to be fed off the common course is—fallow, wheat, beans or clover, and oats. On the Weald Clay the usual rotation is—fallow, wheat, clover, and oats, which is probably as good as any.

The poor barren sands have been rendered productive in some spots by trenching and judicious

planting. Where the iron pan, as it is here called, or the moor-band, which is an almost invariable concomitant of heath, is broken through, trees thrive well; where this is not done, planting is generally an entire loss. Sainfoin is a plant grown with great advantage on the chalky soils of this county, where it thrives well, and leaves the soil improved by the decomposition of its roots.

The hop-gardens of Surrey are about Farnham. The greater value of Farnham hops in the market is probably owing partly to the soil being peculiarly suited to this plant, and partly to the greater care with which it is cultivated.

The wealds of Surrey were, till within a comparatively modern date, one continued forest, and were gradually cleared and cultivated, as timber was in request and land was wanted to raise corn, which, within little more than a century, the wealds did not produce in sufficient supply for the inhabitants, although the population was small. At present the woods have been greatly thinned, and the process of grubbing has gone on most rapidly. The new plantations which are made are either merely ornamental, near the seats of proprietors, or are on the barren sandy soil.

There is no peculiar breed of cattle in Surrey. There is not much good grazing-land, and the beasts that are fatted or kept for milch-cows are of all the breeds usually met with. There was once a peculiar breed of heath sheep, which had a small fleece of fine wool, and very delicate flesh when fatted. The meat was well known by the name of Bagshot Mutton. There is only a small remnant of this breed left, as many of the heaths and commons have been divided, although not cultivated, and the sheep have no longer their former wild and extensive range. The pigs are principally of the Berkshire breed.

Divisions and Towns.—Surrey is divided into 14 hundreds. It is in the diocese of Winchester. It is in the Home Circuit, except that for criminal offences the parts of the county nearest to the metropolis are in the district of the Central Criminal Court. The spring assizes are held at Kingston; the summer assizes alternately at Guildford and Croydon. For parliamentary purposes the county is divided into East Surrey and West Surrey, each of which returns 2 members; besides which, the boroughs of Guildford, Lambeth, and Southwark, return each 2 members, and Reigate returns 1 member: total, 11 members.

The following are the principal towns, with the population of each in 1841:—

Barnes, a village, 8 miles S.W. by W. from Westminster Bridge, through Wandsworth, is situated on the east bank of the Thames. Population of the parish, 1461.

Battersea, a village, 3 miles S.W. from Westminster Bridge, through Chelsea, which is connected with Battersea by a wooden bridge constructed in 1771. Population of the parish, 6887.

Bermondsey, a large suburb of Southwark, which it adjoins on the east, is included in the parliamentary borough of Southwark. Population of the parish and district, 34,947.

Blechingley, a village, 24 miles S. from London, by Brighton Railway and road, was formerly a parliamentary borough, but was disfranchised by the Reform Act. The church is a large and handsome structure of early English architecture. Population of the parish, 3546.

Brixton Hill, a suburban village of Southwark, 5 miles S. from Blackfriars Bridge, is a hamlet in the parish of Lambeth, but is not included in the parliamentary borough of Lambeth. *North Brixton*, 1½ mile nearer London, is included. Population of the district of Brixton, 10,175.

Camberwell, a suburb of Southwark, 3 miles S. by E. from Blackfriars Bridge, is included in the borough of Lambeth. Population of the parish, 14,176.

Carshalton, a village, 4 miles W. from Croydon, is situated on the Wandle, which is here collected into a fine pond. The parish church is a small ancient building. The parish church of the small village of *Beddington*, which is intermediate between Croydon and Carshalton, has been recently partly rebuilt and partly repaired in a style corresponding with the original structure, and in very good taste. There is also a fine old manor-house and park at Beddington. Population of the parish of Carshalton, 2228.

Chertsey, a market-town, 22 miles S.W. by W. from Waterloo Bridge by the South-Western Railway and Chertsey branch, is situated near the S.W. bank of the Thames, across which there is here a stone bridge. The town is irregularly laid out, but the houses are for the most part neatly built of brick. Between the town and the river formerly stood a very large abbey, of which scarcely a vestige remains. Population of the parish, 5347.

Clapham, a suburban village, 3½ miles S.W. by S. from Blackfriars Bridge, has an open space of 200 acres adjoining, called Clapham Common. There are two episcopal chapels, besides places of worship for dissenters. Population of the parish, 12,106.

Croydon, a market-town, 10½ miles S. from London Bridge by the Croydon Railway, consists for the most part of a principal street about a mile in length. The houses are mostly well built, and the town has a clean and respectable appearance. Near the church was a palace belonging to the archbishops of Canterbury, of which some portions are still standing, and are used for a variety of purposes. The parish church is a very large and solid structure, built of free-stone and flints, with a lofty embattled western tower. It is a very fine structure, though the style is somewhat plain. Croydon is a very old town. Population of the parish, 13,627.

Dorking, a market-town, 29 miles S.W. by S. from London by the Brighton Railway and Dorking branch, is beautifully situated on the south side of the North Downs, below Box Hill, and near the south bank of the river Mole. The houses are mostly rather ancient, but are well built, and the town presents a neat and clean appearance. The parish church is a plain structure. The scenery in the neighbourhood is very beautiful. Population of the parish, 5638.

Dulwich, a village, 5 miles S. from London Bridge, consists mostly of a single street of re-

spectable houses. It contains the college founded by Alleyn, to which Sir Francis Bourgeois gave his collection of pictures, now called the Dulwich Gallery, and open to the public by tickets, obtained without difficulty. [ALLEYN; BOURGEOIS.] Population of the village, 1904.

Egham, a village, 21 miles S.W. by W. from the General Post Office, London, by the road through Hounslow, and about the same distance by the Richmond and Staines Railway, consists of a principal street about a mile long, and about half a mile from the south bank of the Thames, which is here crossed by a very handsome stone bridge of modern construction. Population of the parish, 4448.

Epsom, a market-town, 14 miles S.S.W. from London by the road, and about 18 miles by the Croydon and Epsom Railway. The town is irregularly laid out, but has a number of good houses. There is a new and handsome clock tower in the centre of the town. There are mineral springs, whence the salts called Epsom Salts derive their name; and races are held on the adjacent downs. Population of the parish, 3533.

Ewell, a village, formerly a market-town, 13 miles S.S.W. from London by the road, and about 17 miles by the Croydon Railway and Epsom branch, is tolerably well built and paved. About a mile to the N.E. are the remains of Nonsuch Palace, built with great magnificence by Henry VIII. Population of the parish, 1867.

Farnham, a market-town, 38 miles S.W. by W. from London by the road, and 41¼ miles by the South-Western Railway and Guildford and Farnham branches, is situated near the N.W. bank of the Wey, and consists chiefly of one principal street of good houses. The parish church is a large and substantial gothic building, with a heavy embattled western tower. On the summit of a hill on the north side of the town is Farnham Castle, on the site of a castle which was destroyed in the Civil War of Charles I. Farnham is celebrated for the excellence of the hops grown in the neighbourhood. Population of the parish, 6615.

Gatton, a very small place, 2 miles N.N.E. from Reigate, was a parliamentary borough, but was disfranchised by the Reform Act.

Godalming, a market-town and municipal borough, 4 miles S.S.W. from Guildford by the Portsmouth Railway, is situated in a valley on the south bank of the river Wey, over which there is a brick bridge. The town consists chiefly of a principal street about three-quarters of a mile long. The parish church is of Norman and early English architecture, with a low central tower. The borough is governed by 4 aldermen and 12 councillors. Population of the parish, 4328.

Guildford, a municipal borough and parliamentary borough, 30½ miles from London by the South-Western Railway and Guildford branch, is mentioned in the will of Alfred the Great. The town is situated on the east bank of the river Wey, the High Street rising with a steep ascent from the bridge over the river. It contains a large old town-hall, a court-house, a theatre, and a county house of correction. St. Mary's Church is a curious edifice, chiefly of chalk, very ancient, and rudely built. It has a small embattled central tower. Trinity Church was rebuilt of brick about the middle of the last century, with an embattled tower of the same material 90 feet high. St. Nicholas's is on the west side of the Wey. It is an ancient structure, rudely built of chalk and flints, with an intermixture of stone; and is of various dates and styles. It has a low embattled western tower entirely of stone, and some good lancet windows. There is also a new church. On the north side of High Street is Abbot's Hospital, or Trinity Hospital (erected and endowed by Archbishop Abbot, a native of Guildford), a building in the Elizabethan style, of imposing appearance, built round a quadrangular court. There is a free grammar-school, held in an ancient and spacious building. There are also some remains of an ancient castle. The municipal borough is governed by 4 aldermen (of whom one is mayor) and 12 councillors: population, 4074. The parliamentary borough returns 2 members: population, 5925.

Kennington, a district included in the parliamentary borough of Lambeth. Population, 31,289.

Kew, a village situated on the south bank of the Thames, 6 miles W. from Hyde Park Corner, requires notice on account of the Royal Botanical Gardens adjoining, to which the public are admitted gratis, and which of late years have been greatly improved, and now contain one of the finest collections of exotic plants in the world.

Kingston-upon-Thames, a market-town and municipal borough, 12½ miles S.W. from London by the South-Western Railway, is situated on the south side of the Thames. It was a place of note in the Saxon times. Since the opening of the railway a new town has been formed adjoining the railway, named *Surbiton*, or *New Kingston*. The town of Kingston-upon-Thames extends about half a mile along the banks of the river, and about a quarter of a mile inland from it. It is irregularly laid out, at the junction of the Hog's Mill River with the Thames. The houses are of ordinary appearance. There are houses extending, with little interruption, a considerable distance from the town along the roads to London and to Portsmouth. The church is an ancient building, but has undergone from time to time numerous alterations and repairs. There is also a new church at Surbiton. There are meeting-houses for different classes of dissenters. The town contains a modern county court-house and a county house of correction. The town-hall is of modern construction. There is also a borough gaol. There is a free grammar-school held in an ancient building formerly a chapel. The bridge over the Thames is of stone, with five arches: it was erected some years since in place of the ancient wooden bridge which previously stood here. The chief business of the town is malting, which is extensively carried on. The municipal borough is divided into 3 wards, and is governed by 6 aldermen and 18 councillors. Population, 8147.

Lambeth, a parliamentary borough, adjoins Southwark on the W. and S., and comprises the districts of *Brixton*, *Camberwell*, *Kennington*, *Lambeth*, *Newington*, *Peckham*, *Peckham Rye*,

Stockwell, Vauxhall, and *Walworth.* Lambeth Palace, the town residence of the archbishop of Canterbury, exhibits specimens of the architecture of various periods. The chapel and crypt beneath were probably built by Archbishop Boniface as early as the year 1262, but the other parts of the building are of more recent date. Within the last few years the palace has been repaired under the direction of Mr. Edward Blore. The library occupies the four galleries over the cloisters, which form a small quadrangle. There are about 25,000 volumes, some of which are of great rarity. Many of the manuscripts are valuable. Before the Reformation the archbishops had prisons here for the punishment of ecclesiastical offenders. Here the Lollards were confined in a tower which is still called the Lollards' Tower.

Leatherhead, a village, 18 miles S.S.W. from London, is situated on the N.E. bank of the Mole. The church is ancient and small. Population of the parish, 1740.

Merton and *Mitcham,* two adjacent villages, about 8 miles S.W. from London, are situated near the Wandle, which is here used for many manufacturing operations.

Newington, a district included in the parliamentary borough of Lambeth. Population of the parish, 54,606.

Peckham, a suburban village, 3 miles S.S.E. from London Bridge, is part of a district included in the parliamentary borough of Lambeth. Population of the district, 12,563.

Putney, a village, 4 miles S.W. from Hyde Park Corner, is situated on the S. bank of the Thames, and is connected with the village of Fulham on the opposite bank by a wooden bridge. The church is chiefly of the time of Henry VII. Population of the parish, 4809.

Reigate, a market-town and parliamentary borough, 22 miles S. from London by the Brighton Railway. The town is situated at the foot of the southern declivity of the North Downs. It is a small but remarkably neat place, having a large proportion of genteel houses in it. It consists of one principal street, and another street branching from it. The church is built of squared chalk, and is chiefly of perpendicular character, with some good windows, and a lofty embattled tower at the west end, of later date than the rest of the church. The parliamentary borough, which returns one member, is co-extensive with the parish. Population, 4584.

Richmond, a village, 8 miles W. by S. from Hyde Park Corner, and about the same distance by the South-Western Railway and Richmond branch, is delightfully situated on the side and summit of an eminence on the eastern bank of the Thames, over which there is a handsome stone bridge. Along the brow of the hill is a line of genteel houses, with a terrace in front commanding a prospect of exceeding richness and beauty; and along the banks of the river are some delightful villas and grounds. The parish church is a neat brick building of modern erection. The village was called *Sheen* before the time of Henry VII., who rebuilt with great magnificence the royal palace, which had been burned down in 1499, and called the place Richmond, from his having borne the title of Earl of Richmond before his accession. Richmond Palace was a favourite residence of Queen Elizabeth, who died there in 1603. It has since been taken down. Richmond Park was enclosed by Charles I. It comprehends 2253 acres. It contains many very fine oaks. Population of the parish, 7760.

Rotherhithe, a suburban district adjoining Bermondsey on the east, and included in the parliamentary borough of Southwark. Population, 13,917.

Southwark, a parliamentary borough, forms the chief portion of the metropolis on the south side of the Thames. Besides the five parishes which constituted the old borough of Southwark, it comprises *Bermondsey* and *Rotherhithe,* which adjoin it on the east. On the W. and S. it is bounded by the borough of Lambeth, which forms most of the other portion of the metropolis on the right bank of the Thames. St. Saviour's Church, formerly the priory church of St. Mary Overy, near London Bridge, with its Lady Chapel as now restored, is, next to Westminster Abbey, one of the largest and most beautiful of the old gothic structures of the metropolis. The Lunatic Asylum of Bethlehem, the School for the Blind, and the new Roman Catholic Cathedral, are the most striking of the other architectural structures. The borough returns 2 members to parliament. Population, of Southwark itself, 98,098; of the borough, 142,620.

Streatham, a village 6 miles S. by W. from Blackfriars Bridge, consists chiefly of a number of handsome villas. Population of the parish, 5994, including the hamlet of Upper Tooting.

Lower Tooting and *Upper Tooting,* two contiguous villages, 6 miles S.S.W. from London, are situated on the road from London to Epsom. Population of the parish of Lower Tooting, 2840. Upper Tooting is a hamlet of Streatham parish.

Walton-on-Thames, a village, 16 miles S.W. from London by the South-Western Railway, is pleasantly situated on the S.E. bank of the Thames, over which and the flat bank there is here a very long bridge. Population of the parish, 2537.

Walworth, a district contiguous to Southwark, and included in the borough of Lambeth.

Wandsworth, a village, 4 miles W.S.W. from London by the South-Western and Richmond Railway, is situated near the south bank of the Thames, on both sides of the river Wandle. The parish church is a plain modern building, and there is also a handsome new church. Population of the parish, 7614.

Wimbledon, a village, 8 miles S.W. from London by the South-Western Railway, is situated on the south side of Wimbledon Park, which comprises an area of 1200 acres. Population of the parish, 2630.

History and Antiquities.— At the earliest historical period this county seems to have been, for the most part, included in the territory of the Regni (Ῥῆγνοι of Ptolemæus), a nation probably of the Belgic stock, who occupied also the adjacent county of Sussex. Surrey was included in the

Roman province of Britannia Prima. It seems most likely that Surrey was, in the earlier period of the Heptarchy, a part of the kingdom of Wessex, not, as is commonly supposed, of Sussex. It was included, as it appears, from the earliest period in the West Saxon diocese of Winchester; and the earliest hostilities which broke out among the Anglo-Saxons, after their settlement in Britain, was the war between Ethelbert of Kent and Cealwin of Wessex, whose territories it is reasonable to suppose were conterminous.

Surrey had at different periods before the Reformation about thirty religious houses of all kinds. Of these the most eminent were the abbeys of Bermondsey, Chertsey, Merton, and Waverley; and the priories of St. Mary Overy, in Southwark; Newark, near Guildford; and Shene, now Richmond. There are some remains of Merton Abbey. Of Bermondsey and Chertsey Abbeys, and of Shene Priory, scarcely a fragment is left. The priory church of St. Mary Overy still exists. There are some remains of Waverley Abbey, near Farnham, and of the church of Newark Priory. Many of the parish churches in the county are of great antiquity. The early English style, which was in use in the reigns of Richard I., John, Henry III., and Edward I., is prevalent.

In 1215 the Great Charter and the Charter of the Forests (*Magna Charta* and *Charta de Foresta*) were signed by King John at Runnymead, near Egham, on the border of this county. By Henry III. the whole county, which had been gradually afforested by his grandfather Henry II. as a part of Windsor Forest, was, with the exception of Guildford Park, disafforested. Edward I. attempted, but without success, to extend Windsor Forest again into the county. The attempt was renewed as late as the time of Charles I., but again failed.

SURREY, EARL OF. [HOWARD.]

SURROGATE is, according to Cowell's 'Interpreter,' 'one that is substituted or appointed in the room of another, most commonly of a bishop or a bishop's chancellor.'

The qualifications required in persons appointed as surrogates are defined and enforced by the canons of 1603. The principal duty of ecclesiastical surrogates consists in granting probates to wills, letters of administration to the effects of intestates, and marriage licences. The proper performance of these duties is guarded by particular enactments. (92nd of the Canons of 1603 and 93rd Canon; Gibson, 'Cod.,' tit. xxiv., c. 4.)

Surrogates are also persons appointed to execute the offices of judges in the courts of Vice Admiralty in the Colonies, in the place of the regular judges of those courts. The acts of such surrogates have, by the 56 Geo. III. c. 82, the same effect and character as the acts of the regular judges.

SURVEYING is the art of determining the form and dimensions of tracts of ground, the plans of towns and single houses, the courses of roads and rivers, with the boundaries of estates, fields, &c. A survey is accompanied by a representation on paper of all the above-mentioned objects, and frequently by a delineation of the slopes of the hills, as the whole would appear if projected on a horizontal plane. When canals or railways are to be executed, a survey of the ground is combined with the operations of levelling, in order to obtain, besides a horizontal plan, the forms of vertical sections of the ground along the proposed lines, and thus to ascertain the quantities of earth to be removed.

In maritime surveying, the forms of coasts and harbours, the entrances of rivers, with the positions of islands, rocks, and shoals, are to be determined; also the soundings or depths of water in as many different places as possible. [SOUNDINGS.]

Military surveying consists chiefly in representing on paper the features of a country, such as the roads, rivers, hills, and marshes, in order to ascertain the positions which may be occupied as fields of battle or as quarters; and the facilities which the country may afford for the march of troops or the passage of artillery and stores.

Since the measurement of the distance between two objects by means of a rod or chain is very laborious and inaccurate when that distance is considerable, particularly if the ground has many inequalities of level, and is much intersected by walls, hedges, and streams of water, it will seldom be possible to execute even an ordinary survey by such means alone, and instruments for taking angles must be employed, together with the chain, in every operation of importance.

If within the tract to be surveyed there should be a road about half a mile in extent, and nearly straight and level, so that a line may be accurately measured upon it by the chain, and that from its extremities several remarkable objects, as churches or mills, may be seen, it will be convenient to use such measured line as a base, and with a theodolite to observe the angles contained between the base and the lines joining its extremities to the different objects. The three angles of each triangle formed by such lines should if possible be observed, in order that by the agreement of their sum with 180° the accuracy of the angular measurements may be tested; and then the lengths of the sides of the triangles may be determined by the rules of plane trigonometry. After as many stations as may be thought fit have been thus determined, the survey may be completed by actual admeasurements with the chain.

Poles having been set up at the angular points of every triangle, the surveyor or his assistant sets out from any one of these points, and proceeding across the ground, measures the whole length of any one line, leaving pickets in the ground in the direction of the line at or near every place where it crosses a hedge, a stream, a road, or any other object which is to be introduced in the plan. Should it happen that this line, or any part of it, coincides with the direction of a road, offsets, as they are called, are measured perpendicularly to the line, on one or both sides of it, in order to express the distance from the line to the sides of the road, or to the hedges or walls along those sides; these offsets should be measured at the end of every chain's length, and particularly at every point in the station line opposite to which there is a remarkable object, as a house, a gate, or merely a bend in the direction of the road. Thus, when

the work is laid down on paper, the precise form and breadth of the road will be expressed. The like process is to be followed on each side of every triangle.

To carry on the work in the interior of any triangle, the surveyor, where it is possible, measures with the chain the direct distance from the pickets in one side of the triangle to the pickets of another side; and since these pickets are supposed to have been placed near the intersections of boundary-lines (roads, streams, or hedges) with the sides of the triangle, the lines last measured will, at least in part of their length, coincide with or be parallel to some of the boundaries in the interior of the triangle; and the precise figures of such boundaries will be determined as before by offsets from the measured line to all the principal bends.

When rivers or roads have many abrupt and deep bends, the determination of their forms by means of offsets from the station-lines may become impracticable; and then a separate survey of such details must be made by means of the compass, the circumferentor, or the theodolite. The same means must be employed for the survey of a sea-coast, when the operation is to be performed on land; and it may often be advantageous to determine in like manner the forms of the hedges, walls, &c. in the interior of the tract which is to be surveyed. Ground covered with wood must be surveyed by going quite round it. Poles being set up at remarkable bends on the contour, the distances between them are measured with the chain, and the bearings of the several lines from the meridian are observed with the theodolite.

The plane table, which is also occasionally employed for surveying ground, is a square board fitted upon a tripod-stand and furnished with a compass, and with an *alidade*, or ruler carrying 'sights' at the extremities. Drawing-paper is made fast to the board or table, and the instrument being set up at any part of the ground which may be thought convenient, a point is marked on the paper to represent the place. The alidade is next turned about that point, so that the line of the sights may be directed to any remarkable objects whose situations are to be determined, and lines are drawn by the edge of the ruler in its several positions; then the distance from the instrument to some one of those objects being measured, and laid down on its line of direction by a convenient scale, the place of that object on the paper is obtained. The table is then removed to that object, and fixed by the needle in the compass-box, so that its edges may be parallel to their former positions; that is, till the alidade placed on the line joining the places of the two objects on the paper is in a direction tending to the former place of the instrument. In this position, the alidade being turned about the point which represents the actual place of the instrument on the ground, lines are drawn as before along the edge of the ruler, towards the several objects which had been observed at the preceding station: the intersections of these lines with the others will determine the places of the objects on the paper. The length of every line which is to be measured must be obtained in a direction parallel to the horizon between its extremities; and the determination of this length is generally a work of considerable difficulty, on account of the inequalities of the ground.

Where great precision is required, it would be proper that the direction of the line to be measured should be indicated by pickets previously planted at intervals along it. A cord may be stretched tight between the two first pickets, and the measurement may be performed by means of a graduated deal-rod 15 or 20 feet in length, which should be applied successively to the cord, the place of each extremity of the rod being marked by a pin pressed into the cord. But when the ground is nearly level, a measuring-chain is laid upon the ground itself in the direction of the line to be measured, and the leading man presses into the ground, at the end of each chain's length, an iron pin, which being taken up by the person who follows, the number of pins so taken up serves to show the number of chains in the length of the line measured. In ascending or descending any gentle elevation of the ground, the chain should be held up at the lower end till it is in a horizontal position, as nearly as the chain-holder can estimate it; and a plummet being suspended from that extremity so as to touch the ground vertically under it, the measurement thus obtained is in general sufficiently near the required horizontal length of the line.

It is now the practice to represent on a plan of the ground a vertical section in the direction of a proposed line of road, for the purpose of showing the depths to which the excavations are to be carried, and the heights to which the embankments are to be raised: both the heights and depths being determined with relation to the surface of the road. This method was first proposed by Mr. Macneil.

The principal and secondary station-lines constitute a triangulation on the plan of the ground; and when the lengths of these lines have been ascertained by admeasurement, the superficies of the whole track may be found by the rules of mensuration. The area of each triangle should be calculated separately from the measured lengths of the lines, and the several results added together, if all the triangles lie within the given boundaries of the tract: should any of them lie on the exterior of the boundary, the areas must of course be subtracted.

When a road, river, or any boundary-line is surveyed with the theodolite and chain, the successive operations are registered in a book according to a particular form, by which a person without any knowledge of the ground may be enabled with facility to lay the work down on paper. This is called the 'Field-Book.' Each of its pages is divided into three columns by two parallel lines drawn down it: and, beginning at the bottom of the column, the several bearings of objects, the lengths of the station-lines, and the several offsets from those lines, are inserted, in order, ascending towards the top of the page, the offsets being placed on the right or left hand of the middle column, conformably to their positions with respect to the station-

line to which they belong. And it is on this account that the several entries are made in succession from the bottom upwards. In order to 'plot' the survey, or lay down on paper a plan of the ground, if performed by the chain only, a proper scale of graduations, usually representing 'chains' and 'links,' is chosen, and the length of one of the station-lines taken from the scale being laid down on the paper as a base, from the two extremities of it as centres, with distances (taken from the scale) equal to the measured lengths of the two sides, which with the base form the first triangle, arcs are described to intersect one another. This intersection being joined to the extremities of the base by lines, the first triangle is constructed. Each side of this triangle is then used as a base on which another triangle is constructed with lines taken from the scale equal to the measured lengths of the sides, and so on. After the triangulation is thus formed, the offsets are laid down from them. In order to facilitate this last operation, the surveyor is usually provided with ivory scales graduated to represent chains and links on the edges; by laying an edge of such scale along the station-line, with the zero of the graduations at one end, the several distances of the offset-lines from that extremity can be marked on the line in succession: the scale may then be applied to each offset-line, and the measured extent marked by means of the graduations.

To find a convenient scale for plotting a survey, the length and breadth of the whole may be computed approximately in order to ascertain the number of chains in such length or breadth, and then the dimensions of the paper in inches being known, the number of chains in each inch may be formed by proportion. Plans of estates are usually made from scales of 2, 3, or 4 chains in an inch, and the linear dimensions, on a plan made from a scale of 3 chains in an inch, are equal to $\frac{1}{2178}$ of the actual dimensions on the ground.

In important surveys, where the process consists in measuring a base-line and observing with a theodolite the three angles of every triangle, the base is laid down on the paper from scale as before; and at each of its extremities all the angles contained between the base-line and visual rays from different objects to that extremity are set out by means of a protractor. The intersections of the several lines from the opposite extremities of the base determine the positions of the objects, and form with the base the first triangles. The sides of these triangles become then the bases of other triangles, and the angles observed at the extremities of their sides must be set out, as before, by the protractor.

But the practice in ordinary surveys is, to observe the bearings which the different station-lines make with the meridian-line passing through one of the stations, and to measure with the chain the length of each station-line. These bearings and lengths, together with the offsets, are registered in the field-book. The directions of the lines are then transferred to the paper by means of a protractor, the angles being set out from lines drawn parallel to one another to represent the magnetic meridians; and the lengths given to the lines are taken from the plotting scale. From these lines the offsets must be set out as before described.

In order to set out the allotments of land in countries which, like some parts of North America, are covered with wood, the surveyor determines on the ground the position of a boundary-line comprehending an area of a square form, each side of which is six or eight miles in length. One of these spaces, which constitutes a township, is usually divided into squares of one mile on each side; and again, these are divided into squares of half or a quarter of a mile on each side.

The boundary-line of the township is determined by measuring with a chain a base-line six or eight miles in length, generally along one side of a square already marked out for some previous township; and at each extremity of this line carrying out one of equal length perpendicularly to the base. A line joining the farthest extremities of the last lines completes the square. Strong stakes are planted at the end of each mile, half mile, and quarter mile on the lines, and from these stakes the lines of division and subdivision are carried out in a similar manner.

When the allotments are contiguous to a road, or the bank of a river, a narrow front is measured along the road or river, and the boundary-lines are carried out, perpendicularly to the front, as far as may be requisite in order to comprehend between them the intended area.

SURVIVORSHIP. A question of life contingencies is said to be one of survivorship when a benefit depends upon the order of the deaths of individuals in such manner that it shall be necessary to calculate the chance of one individual dying before another in every year of life. This distinctive name depends therefore entirely upon the mathematical character of the problem, and of two questions, which both seem to depend on survivorship in the common sense of the word; one may really do so, in the technical sense, and not the other. Thus the question of finding the premium of an assurance on the death of A, provided B die first, is one of survivorship: but that of finding the value of an annuity on the life of A, to begin at the death of B, is not.

The *chance of survivorship* is that of one individual, now of a given age, surviving another, also now of a given age. Thus, according to the Carlisle Table, the chance that a person aged 65 will survive one aged 25 is .110; consequently the chance of 25 surviving 65 is $1 - .110$ or .890; and it is 890 to 110, or about 8 to 1, that of two persons aged 65 and 25, the elder shall die first.

SUSA, the capital of the country called Susiana and Susis by the Greek geographers. It lay between Persis and Babylonia, and it comprised part of a mountain region, and extended also to the coast of the Persian Gulf. The Choaspes flowed through Susiana, from the mountains of the Uxii, and it entered the Persian Gulf within the limits of the sea-coast of Susiana. Besides the Choaspes, there were the rivers Coprates and the Pasitigris, which flowed from the mountains of the Uxii. The Eulæus is also enumerated among the rivers of Susiana.

The modern Khuzistan, which perhaps com-

prehends pretty nearly the ancient Susiana, lies between 30° and 32° 30′ N. lat., and between 48° and 50° E. long. From about 31° 30′ N. lat. to 30° the country is flat; north of 31° 30′ it begins to be hilly, and north of 32° the country may be called mountainous. The first great stream, beginning from the west, is the Kerkhah (more usually, but perhaps less correctly, written Kerah), which enters the united streams of the Tigris and Euphrates a little below Kornah, and is identified with the Choaspes. To the east of this river, near 32° N. lat., is the modern Sus. The next stream, to the east, is the Kuran, or Karoon, as it is sometimes written, which joins the Shat-al-Arab by the Hafar cut. This river is formed by two great branches, of which the Dizful, the ancient Coprates, is the western, and the Kuran, which flows by Shuster, is the eastern branch. The Dizful and Kuran unite about twenty miles below Shuster; and form the stream anciently called the Pasitigris, and sometimes the Eulæus, though the Eulæus, properly so called, is another branch of the Kuran, which will presently be mentioned. East of the Kuran is the Jerahi, which likewise flows from the high land, and either enters the Gulf of Persia or is united by a channel with the river of Shuster after its junction with the Dizful river. The Jerahi is supposed, but without any good reason, to be the Hedypnus of Pliny.

In proceeding from Dizful to Sus, and at the distance of 10 miles from Dizful, the great mound of Sus is seen. 'It forms the north-western extremity of a large irregular platform of mounds, which appear to have constituted the fort of the city, while the great tumulus represents the site of the inner citadel. By a rough calculation with the sextant I found the height of the lower platform to be between 80 and 90 feet, and that of the great mound to be 165 feet: the platform, which is square, I estimated to measure two miles and a half. The mound which I paced measured 1100 yards round the base and 850 round the summit. The slope is very steep; so steep indeed as only to admit of ascent by two pathways.' (Major Rawlinson.) There is abundance of fine grass about the ruins of Sus and the neighbouring country; and the climate in the middle of March was cool and pleasant. From the summit of the great mound, Dizful is distinctly visible, bearing north 38° east. The Kerkhah river is one mile and a half west of the great mound of Sus. A stream called the Abi-shapur rises about 10 miles north of Sus, and flows in a deep narrow channel past the so-called tomb of *Daniel*, and past the western face of the great mound: it is said to join the Kuran in the neighbourhood of Weis, a considerable distance below the junction of the Dizful river and the river of Shuster. Major Rawlinson could discover no traces of buildings in the interval between the Abi-shapur and the Kerkhah. The Abi-shapur is navigable from Sus to its junction with the Kuran, and as its bed is deep and narrow, and nearly on a level with the surface of the plain, it is peculiarly suited for some kinds of navigation. Thus it appears that Sus is really on the east side, not of the Kerkhah (Choaspes), but of a navigable river which flows into the ancient Pasitigris, which navigable river is the ancient Eulæus. The circumstance of the proximity of these two streams explains the confusion that appears in ancient writers between the Eulæus and Choaspes. The water of the Abi-shapur is said to be heavy and unwholesome, while that of the Kerkhah is said to be little inferior to that of the Kuran. It thus appears that Sus is the site of an ancient city, which it is now generally agreed is the Susa of the Greek writers, once a residence of the kings of Persia. The principal arguments in favour of Sus being the site of Susa are collected in a paper in the 'London Geographical Journal,' vol. iii., 'On the site of Susa,' by G. Long; and some further remarks by the same, vol. xii., p. 104.

Shuster, which has by some geographers been considered to be the site of Susa, is a comparatively modern city, which was founded by Ardeshir Babegan, or his son Shapur, on the left bank of the Kuran. Shuster is nearly due east of Sus, and the distance is about 55 miles from the road. There are two great bands or dykes at Shuster, constructed for the purpose of furnishing a head or supply of water to the city and the lower country. There are no ruins at Shuster which can be referred to a time prior to the Sassanian dynasty.

SUSA. [TORINO.]

SUSA'RION was a native of Megaris. He lived about the time of Solon, and the Parian Marbles ('Ep.' 39) call him the inventor of comedy. We know that the Megarians were very fond of farcical entertainments, but it is also certain that the invention of real and written comedies belongs to a later time. ('Dissert. on the Epist. of Phalaris,' p. 144.)

SUSPENSION, ECCLESIASTICAL, is a mode of censure or secondary punishment inflicted by the church on persons guilty of those minor offences which do not deserve the severer penalties of deprivation or excommunication. 'In the laws of the church,' says Bishop Gibson, 'we read of two sorts of suspension—one relating solely to the clergy, the other extending also to the laity.'

'That which relates solely to the clergy is suspension *ab officio et beneficio* (*i.e.* the duties and income of his office) jointly, or *ab officio* or *beneficio singly*, and may be called a temporary degradation or deprivation, or both.' 'The other, which relates to the laity also, is suspension *ab ingressu ecclesiæ* (*i.e.* from entering the church), or from the hearing of divine service and receiving the holy sacrament, which may therefore be called a *temporary excommunication*.' He also observes that the two sorts of suspension agree in this, that both are inflicted for crimes of an *inferior* nature; that both, in *practice* at least, are temporary; and lastly, both, if unduly performed, are attended with further penalties. (See Gibson, 'Cod.,' tit. xlvi., cap. 3.)

Suspension has been retained as a mode of punishment in the English church. See the Canons of 1603, Nos. 33, 35, 36, 68, 92.

SUSPENSION-BRIDGE, a bridge in which the weight of the roadway, instead of resting

upon arches of masonry, or on a rigid framework of wood or iron, is supported by the tension of ropes, chains, or rods.

Though it is only within the last thirty years that suspension-bridges have been constructed to any considerable extent in this country, such structures are by no means of recent origin. The Chinese chain-bridges, and the rope-bridges of Bootan and of South America, are examples. Rope-bridges have long been used in military operations in Europe. Sir Howard Douglas, in his 'Essay on the Principles and Construction of Military Bridges,' describes several of them. One of the most interesting applications of rope-work in the form of a bridge was made in 1812, at the passage of the Tagus by the British army. The object was to provide a passage over Trajan's Bridge at Alcantara, one of the arches of which had been destroyed by the French. The gap was near 100 feet wide, and 140 feet deep; and over this a net-work of ropes and timber, which had been prepared, was stretched, its extremities being made fast to the remaining masonry of the piers.

We have no account of the existence of iron suspension-bridges in Europe before the middle of the last century. The earliest appears to have been a small one built across the river Tees, at an elevation of about 60 feet, two miles above Middleton, for foot-passengers only. The first iron suspension-bridge built in America was that constructed in 1796, by Mr. Finlay, across Jacob's Creek, on the road between Union Town and Greenburgh, the length of which was about 70 feet. Mr. Finlay subsequently, in 1801, obtained a patent for the construction of such bridges, and built several in the United States; one of which, over the Schuylkill, was 306 feet long. In 1807 a scheme was proposed by M. Belu, a French engineer, for crossing the Rhine, between Wesel and Ruderich, by a bridge about 820 feet long, to be supported by a net-work of wrought-iron chains. In 1814 a bridge of similar construction was proposed for crossing the Mersey at Runcorn Gap, so as to form a direct communication between Runcorn in Cheshire and Liverpool. In 1816 a suspension-bridge was built across Gala Water, made of thin wires, at a cost of only about 40*l*., although its span was 111 feet.' Another wire bridge of about the same length was built in 1817, across the Tweed, at King's Meadows, at an expense of 160*l*. The platform was 4 feet wide, and was sustained by wires radiating from the tops of two cast-iron columns at each end of the bridge. Sir Samuel Brown soon afterwards introduced an improved method of constructing chains for suspending the roadway. Chains of the ordinary form, with short links, are very defective in strength; and several difficulties, among which is the great extent of surface exposed to oxidation, attend the use of cables consisting of small rods or wires. The plan adopted by Sir S. Brown was to form chains of round or flat bars of iron, several feet long, having either welded eyes or drilled holes at each end, and being connected together by short links and bolt-pins. The first extensive bridge erected upon this plan was the Union Bridge across the Tweed, near Berwick, opened for use in 1820. The length is 449 feet, and the deflection is about 30 feet. There are twelve suspending chains, arranged in pairs side by side, and in three tiers, one above the other; each chain being formed of round rods, 15 feet long, and 2 inches in diameter. The suspension-rods are round, an inch in diameter, and are attached alternately to each of the three tiers of chains. In 1821 Brown commenced the Trinity suspension-pier at Newhaven, near Edinburgh, which consists of three spans of 209 feet each, with 14 feet deflection. In 1818 the Holyhead Road Commissioners applied to Telford for his opinion respecting the erection of an iron suspension-bridge at the Menai. A brief account of this beautiful bridge, and of the yet more extraordinary Britannia Tubular Bridge, recently erected near it by Mr. Robert Stephenson, will be found under MENAI STRAIT.

While the Menai Bridge was in progress Sir S. Brown constructed the suspension-pier at Brighton, which consists of four openings of 255 feet each, with a deflection of 18 feet; and Mr. W. Tierney Clark commenced in 1824 the Hammersmith suspension-bridge, the first erected in the vicinity of London. The central opening of the Hammersmith Bridge has a chord-line of 422 feet, with a deflection of about 30 feet. The width of the bridge is about 30 feet, there being a carriage-way of 20 feet, and two side footpaths of 5 feet each. There are eight chains, arranged in four double lines, or in two vertical tiers. The chains on each side of the carriage-way consist of six bars each, placed side by side; but the outermost chains, on the outside of the footpaths, consist of three bars each. The suspension-rods are one inch thick, and about 5 feet apart: and the platform is supported upon double joists of Memel timber, consisting of two pieces 12 inches deep and 4 inches wide. The Hungerford Suspension Bridge, or Charing Cross Bridge, which was opened April 18, 1845, is for foot-passengers only, and crosses the Thames from Hungerford Market to the Belvidere Road, Lambeth. The chains are borne by two towers in the river, 22 feet square and 80 feet high, the height of the roadway above high-water mark being 32 feet. The span of the centre between the two towers is 676 feet 6 inches, of each of the side arches 333 feet. The roadway is supported by single suspension rods 12 feet apart on each side. It was built under the direction of Mr. I. K. Brunel.

Some suspension-bridges have been erected in which the main chains, instead of passing over a pier or tower at or near each end of the platform, are supported by a single tower in the centre of the bridge, and form what may be called two semi-catenaries. A bridge of this kind was built in 1823 by Sir M. I. Brunel, in the Isle of Bourbon. The bridge consists of two openings of 122 feet each; and, to resist the strain occasioned by hurricanes, which often blow upwards as well as sideways, a set of chains is added under each half of the bridge, in the form of an inverted catenary. Another peculiarity in these bridges is the circumstance that the chains do not rest upon

saddles or rollers in the suspension-towers, but are suspended by links from a strong framework of cast-iron, by which means very free motion is allowed to the extent necessary to allow for changes of temperature. A few suspension-bridges have been built in which the chains are suspended below the platform, which is supported by framework built upon instead of hanging from them.

Some small bridges of wire have been alluded to already, and Drewry describes several of large dimensions which were erected on the Continent soon after the introduction of suspension-bridges upon an extensive scale in Great Britain. The first large one erected in France was that of Tournon, across the Rhône, between Tain and Tournon, in 1824–5; it consists of two openings of 278 feet each. Another remarkable wire-bridge is that over the Sarine, at Fribourg in Switzerland, which was completed in 1834, by M. Challey. It has a span, from pier to pier, of 870 feet, and is 167 feet above the level of the river, being much longer and higher than the Menai Bridge. The platform is suspended from four cables, arranged in pairs at the sides of the bridge, with a deflection of 55 feet. The wire of which the bridge is composed is about one-twelfth of an inch in diameter, and each cable consists of fifteen bundles of eighty wires each, packed together in a cylindrical form, and bound round at intervals of two or three feet with annealed wire. The wires are not twisted together like the strands of a rope, but each of them extends straight from end to end of the cable. The two pairs of cables are suspended at a distance of 30 feet from each other, but the width between the lower ends of the suspension-rods is only 24 feet, so that their position is not quite vertical. These rods are small cables, consisting of thirty wires similar to those of which the cables are composed. The roadway is formed of fir planks, supported by transverse beams, and stiffened by a strong oak railing, or diagonal truss. The bridge was completed at a cost of 24,000*l.*, and was publicly opened in 1834.

The use of wire instead of bar-chains in the construction of suspension-bridges is favoured by the simplicity of the apparatus necessary for their erection, and the superior strength, bulk for bulk, of small wires over bars of considerable dimensions. In some instances the chain system and the wire system have been combined. There is a chain bridge at Geneva, in which both the long and short links may be called skeins of wire, bound round into a cylindrical form in the centre, and spread out into broad loops at the ends, where they embrace the hollow bolts. The structure is in fact, a chain-bridge, of which the chain-bars and linking-plates consist of bundles of wire instead of solid bars.

Several suspension-bridges of small span have been constructed upon an ingenious plan which combines the advantages of the opposite principles of tension and compression. The first of these was the Monk Bridge, across the river Aire at Leeds, which was erected in 1827, by Mr. George Leather, of that place. The platform is supported by vertical suspension-rods, the upper ends of which, instead of being attached to catenarian chains, are supported by rigid arches of cast-iron, which, rising between the carriage-way and the footpaths, are elevated above the level of the platform. The suspending-rods are of malleable iron, and they sustain transverse cast-iron beams upon which the roadway is laid. Timber bridges have been constructed on a similar principle to the above. Drewry mentions one at Eglisau, near Zürich, in Switzerland, consisting of two arches formed of beams 15 feet long, 10 inches broad, and 1 foot deep, with their abutting ends secured by iron straps. The ends of the arches are tied together by horizontal braces, and the weight of the platform is suspended by vertical bars arranged in pairs, which embrace the wooden arch or rib, and are bolted together above it.

Much attention has been excited by the principle of constructing suspension-bridges introduced by Mr. Dredge of Bath, who obtained a patent for his invention in 1836. The leading features of his plan are the adaptation of every part of the chain to the precise amount of strain to which it is exposed, by diminishing the number of plates, and consequently the weight and strength of the chains, from the points of suspension to the lowest or central point of the catenary; and the position of the suspending-rods, which, instead of being vertical, are arranged in oblique lines from their points of attachment to the main chains towards the centre of the catenary. The Victoria Bridge, over the Avon, at Bath, which was built on this plan in 1836, contains only twenty-one tons of iron, although it is of 150 feet span. The number of bridges since built on this plan is very considerable. An example of them on a very small scale may be seen in the Regent's Park. In some experiments tried at the Adelaide Gallery, London, it was found that a small wire-bridge of the ordinary construction, consisting of six ounces and a half of wire, and forming a span of 5 feet 8½ inches, broke with the weight of eight persons; while a similar bridge, formed of only six ounces of wire, on Dredge's plan, bore eleven persons, until one of them stamped, when it broke down. In 1827–8 a suspension-bridge of *steel* was erected over the Danube at Vienna, by an engineer named Von Mitis, whose preliminary experiments upon various kinds of steel are recorded by Drewry. Von Mitis advocates the use of steel in lieu of iron for such structures, but Drewry considers that, even if the cost were not a prohibition to its use in this country, its advantages may be questioned, since the greater lightness of a steel suspension-bridge in proportion to its strength would render it more liable to vibration than those of iron. The bridge alluded to at Vienna has a chord-line of 334 English feet, with a deflection of nearly 21½ feet, and its vibration is said to be considerable.

Perhaps the finest suspension-bridge ever constructed is that built by Mr. Tierney Clark over the Danube at Pesth. In magnitude and in cost it exceeds all others. It was finished in 1849, and was shortly afterwards traversed by the Austrian and Hungarian armies.

Suspension-bridges are well adapted for many

situations in which, from the limited traffic, the expense of ordinary stone bridges would prevent their adoption, and also for places in which, from the great span required, the great elevation, the unfavourable nature of the bottom, or the rapidity of the current to be crossed, the erection of any other kind of bridge would be difficult; but they are not applicable to situations of great and constant traffic, since they are much weaker than arch-bridges, and very liable to injury from the vibration occasioned by what might appear slight forces.

SUSQUEHANA. [PENNSYLVANIA.]

SUSSEX, a maritime county in England, lies between 50° 43′ and 51° 9′ N. lat., and 0° 49′ E. long. and 0° 58 W. long. It is bounded N.E. by Kent, W. by Hampshire, N. by Surrey, and S. and S.E. by the English Channel. The greatest length E. to W. is 76 miles: the greatest breadth N. to S. is 27 miles. The area is 1466 square miles. The population in 1841 was 299,753.

Surface and Coast.—The principal feature in the surface of Sussex is occasioned by the high ridges of chalk hills generally known as the Downs. These hills commence on the E. at the promontory of Beachy Head, and trend W. as far as Shoreham, occupying a surface of about 26 miles in length, and 6 or 7 in breadth. This tract is named the South Downs. From Shoreham the Downs gradually recede from the coast and traverse the western part of the county, and enter Hampshire near Petersfield. Their extreme length in Sussex is 53 miles, their greatest breadth 7 miles, and mean breadth 4½ miles. Many of the hills are more than 500 feet above the level of the sea. Ditchelling Beacon, the highest point, is 858 feet above the sea. The Downs have a covering of short and delicate turf, and occasional patches of common furze. The whole district is without trees, except in some declivities where trees are planted, and the white thorn grows. The surface of the Downs is undulating. The northern escarpment is precipitous, but the southern declines gently, and W. of Brighton gradually blends with the low land of the coast.

The maritime district lies between the Downs and the sea, and extends from Shoreham W. to the boundary of Hampshire, where it becomes about 7 miles wide. This district is of remarkable fertility.

The centre of the county is occupied by a woodland tract, which extends from the Downs, to which it runs parallel, to the Surrey Hills, denominated the Weald (Saxon *Weald*, a forest). The Weald was once an immense forest, which was inhabited by hogs and deer, but it has been gradually cleared and brought into cultivation.

The Forest Ridge is that high tract of the county which, gradually uniting with the Weald, forms the E. and N.E. division of the county. It stretches from Hastings W., and extending towards Uckfield and round by Crowborough, terminates near Horsham. In this district are two great forests, St. Leonard's Forest, containing 10,000 acres, and Ashdown Forest, containing about 18,000. Pine, fir, beech, and birch all grow well. The whole ridge is the most romantic part of Sussex. It is broken into hill and dale, and is very elevated. Crowborough Beacon, the highest and most central eminence, is 804 feet above the level of the sea.

The coast at the extreme east of the county is formed of the low marsh-land, which is a continuation of the low land of Romney-Marsh. The Forest Ridge breaks in at Hastings for a few miles. The low marsh land of Pevensey, forming Pevensey Bay, extends from Bexhill to the Downs at East Bourn, near Beachy Head. The high chalk cliffs of the Downs extend thence as far as Brighton, when the low land of the maritime district intervenes and forms the coast-line into Hampshire.

Rivers.—The principal rivers are the Ouse, the Rother, the Adur, the Arun, the West Rother, the Cuckmere, and the Lavant.

The Ouse begins a few miles N. of Cuckfield by the junction of two streams, and flowing E. and then S., passes by Lewes to the English Channel at the new mouth of Newhaven, forming what is called Newhaven Harbour: the former outlet at Seaford is closed. The river is navigable for large barges 12 miles from its mouth without the aid of locks, and with them as far as Lindfield.

The Rother rises near Rotherfield, and passing by Mayfield, flows E. towards Kent. It then turns S., and passing by Rye, forms Rye Harbour, falling into the sea by an æstuary. The Rother is navigable as far as the point where it just touches the borders of Kent above Newenden. This river formerly emptied itself into the sea at New Romney in Kent, 12 miles E. of its present exit; but in the great storm of October 1, 1250, which overwhelmed Old Winchelsea, and during the great inundation of the sea, this river forsook its ancient channel and formed the new one to Rye. Several affluents join the Rother, which for a considerable part of its course forms the boundary between Sussex and Kent. In the year 893 a Danish fleet of 330 sail, under the command of the pirate Hastinges, assembled near Boulogne, and directed its course to the English shores. Most of the vessels entered the Rother, then called the Limene. In the year 1822 one of these Danish ships was discovered embedded in ten feet of mud and sand in a field at Northiam, a short distance from the present river, and about 2 miles from Newenden. The ship was in a perfectly sound and entire state after a lapse of 929 years. Her dimensions were from head to stern 65 feet, and her width 14 feet, with cabin and forecastle; and she appeared to have originally had a whole deck. She was very strongly built.

The Adur has two main sources, one of which flows S.E. past West Grinstead, and the other S.W. through Twineham and Shermanbury. The streams unite about 4 miles N. from Bramber, and then flowing S. the Adur falls into the sea at New Shoreham.

The Arun rises in St. Leonard's Forest, and flowing W. and then S. receives the Western Rother between Stopham and Pulborough. It then flows S. past Arundel to the sea at Little Hampton. The tide flows nearly 17 miles up the river, but the backwater is of little value, in consequence of the narrowness of the channel and the sluggish-

ness of the stream. The larger vessels which enter usually remain near the river's mouth at Little Hampton, but a vessel of 13 feet draught can proceed to Arundel Bridge, a distance of 6 miles.

The Cuckmere rises in the Forest Ridge near Heathfield, and flowing S. empties itself into the sea at the opening in the South Downs, W. of Beachy Head.

The Lavant is a small stream which encircles the city of Chichester on all sides except the north, falls into the harbour of Chichester, and enters the sea at the extreme S.W. corner of the county.

The Medway also rises in the northern part of the county, and reaches the county of Kent between Groombridge and Ashurst, forming the boundary between the two counties for about a mile, and then turns at Ashurst directly into Kent.

A canal called the Arun and Wey Junction Canal, formed under an Act of 53 Geo. III., connecting the Arun with the river Wey, completes an inland communication by water with London. The Arundel and Portsmouth Canal also enters the Arun at Ford, connecting it with Chichester Harbour; and a canal following the course of the Rother has made a navigable water-communication from Stopham Bridge to the town of Midhurst, with a branch to Haslingbourne, within half a mile of Petworth.

The London and Brighton Railway connects the metropolis with the nearest point of the sea-coast. The South Eastern Railway passes off from it at Reigate, and extends to Folkstone and Dover, with branches to Maidstone, to Tunbridge Wells, and through Canterbury to Ramsgate, Margate, and Deal. The South Coast Railway extends from Gosport (where it is connected with the South Western Railway), through Chichester, Brighton, and Lewes, to Hastings.

Climate.—The climate of the southern part of the county, near the sea-coast, is mild, and not subject to many variations of temperature. The mean temperature of the year is 51.10°, more than one degree above the mean temperature of London. The northern part of the county, particularly the Forest Ridge, is of considerably lower temperature. The temperature of the Weald is somewhat less than that of the south coast, but the climate is agreeable and healthy.

Geology.—The greater portion of the southern part of the county is occupied by the chalk formation, which constitutes its most striking geological feature. The chalk is regularly stratified. The upper division contains horizontal layers of siliceous nodules with intersecting veins of tabular flint: sulphuret of iron is found in irregular masses and in octahedral crystals. Chalk marl constitutes the foundation of the chalk hills. Its outcrop composes a fertile tract of arable land, on which are some of the best farms in the county. Below the marl is a bed of firestone, which forms a terrace of considerable breadth in the W. part of the county. The gault, the lowest division of the chalk formation, generally constitutes a valley within the central edge of the chalk. Next to the chalk the most important formation is the Wealden. It joins the gault and extends through the centre of the county. It is a series of clays and sands with subordinate beds of limestone-grit and shale. The wealden-clay is a tenacious clay of various shades of blue and brown, containing subordinate beds of limestone and sand with layers of septaria of argillaceous ironstone. The Sussex marble occurs in layers in different parts of the district. It is a limestone of bluish-gray mottled with green and ochraceous yellow. The central group of the Wealden is formed of alternating sands, sandstone, and shale, which have been denominated the Hastings Sands. These sands extend on the E. and N.E. of the county. Below this are the Tilgate beds, which extend from the western extremity of the Hastings Sands at Loxwood to Hastings, and are separated from the next subdivision by blue clay and shale. This subdivision, called the Worth Sands, consists of a series of arenaceous strata, some of which form a fine soft building stone extensively used. The last division of the Wealden is composed of the Ashburnham beds, which occur beneath the Worth stone: they are composed of alternations of sand, friable sandstone, shale, and clay: they are for the most part highly ferruginous, and enclose rich argillaceous iron-ore and large masses of lignite. It was in the Wealden strata, when wood was abundant and charcoal employed in smelting iron, that the chief iron-works of Sussex were situated, the iron-ore being extracted from the iron-stone of the argillaceous beds. Up to the year 1720 Sussex was the principal seat of the iron-manufacture in England; but by degrees the furnaces were disused and the manufacture transferred to districts where coal was abundant. The last furnace, at Ashburnham, was blown out in 1827.

Agriculture.—The rich marsh-lands, of which there are about 30,000 acres in the county, make an excellent pasture-ground, on which many oxen and sheep are reared and fatted for market. There are also about 50,000 acres of down-land, where the soil is thin and very near the chalk, which are unfit for the plough. They are therefore left in down, and produce excellent pasture for the small sheep known as Southdown sheep. The natural grasses, when kept cropped by sheep, are sweet; but if the Downs are not sufficiently stocked, the coarse grasses soon become prevalent.

Throughout the whole of the Wealden district, upon the sand as well as the clay soils, the land is extremely poor; and of the 903,000 acres cultivated within the county, 425,000 are situated within this district. The clay is cold and stiff, and very difficult of drainage; but it produces fair average crops of wheat. The usual rotation of crops is, wheat, oats, clover or trefoil one or two years, and then a fallow.

The arable land on the Downs consists of thin light layers of earth, not exceeding 8 inches in depth, intermixed with flint pebbles, and is very favourable for the growth of barley and wheat. Wheat is usually sown once in four years, the course being turnips, barley, clover, and wheat, changing the clover for peas or some other crop the eighth year. In some of the hollows the soil is deeper and more loamy.

Hops are cultivated to a considerable extent in the eastern part of the county. They have been

introduced from Kent, and have gradually extended themselves westward. Upwards of 8000 acres are now under cultivation. The produce however is not so much esteemed in the market as that of Kent.

The county is noted for its breed of oxen and of sheep. The Sussex ox bears a strong resemblance to the Devon: it has a small and well-formed head, the horns pushing forward a little, and then turning upward, thin, tapering, and long, not so as to confound the breeds with the long-horns, and yet in some cases a little approaching to them. The colour is a deep chestnut-red, and some of a blood-bay. This ox holds an intermediate place between the Devon and the Hereford, with all the activity of the first and the strength of the second; with the propensity to fatten, and the beautiful fine-grained flesh of both. The Sussex cow is a very inferior animal to the ox: she yields a very small quantity of milk, and is principally kept as a breeder.

The Southdown sheep are among the best for all hill countries where the grass is short; and their kindly properties have caused them to penetrate into almost all parts of the country. They have a patience of occasional short keep, and an endurance of hard stocking equal to any other sheep, and an early maturity scarcely inferior to the Leicester, while the flesh is very fine grained and of peculiarly good flavour. [SHEEP.] The breed of horses is not famous.

Divisions and Towns.—Sussex has been for centuries divided into six Rapes, a term peculiar to the county, the derivation of which is not satisfactorily settled. These divisions are named Lewes Rape, Pevensey Rape, Hastings Rape, Chichester Rape, Arundel Rape, and Bramber Rape. The Rapes are subdivided into hundreds. Nearly the whole of the county is in the diocese of Chichester. It is in the Home Circuit, and the assizes are held at Lewes. For parliamentary purposes it is divided into East Sussex and West Sussex, each of which returns 2 members; besides which the boroughs of Brighton, Chichester, Hastings, Lewes, and New Shoreham, return each 2 members; and Arundel, Horsham, Midhurst, and Rye, return each 1 member; total, 18 members.

The following are the principal towns, with the population of each in 1841:—

Arundel. [ARUNDEL.]

Battle, a market-town, 22 miles E. by N. from Lewes, received its present name in consequence of the great battle between the Saxons and Normans, in which the Saxons were defeated, and Harold, their king, was slain, Oct. 14, 1066. William the Conqueror commenced the following year an abbey on the site, the high altar of its church being placed, as is stated, on the spot where Harold was slain. The ruins of Battle Abbey, which stand on a gentle rise, occupy three sides of a large quadrangle, and the whole area, when the fourth side was standing, was about a mile in circuit. The grand entrance is in the side which fronts the town, and is a large square building, embattled, with an octagon tower at each corner. The town consists of one street extending along a valley. The parish church is a handsome gothic building, with windows of painted glass in the north aisle, exhibiting various figures, portraits, and devices. Population of the parish, 3039.

Bognor, a small bathing place, 6 miles S.E. from Chichester, is situated on the coast. The houses are neat, and the promenade extensive. Population of the township, 576, but it is rapidly increasing.

Bramber, a village, near to Steyning, is situated on the west bank of the Arun. It was formerly a parliamentary borough, but was disfranchised by the Reform Act. It is a very small place.

Brighton. [BRIGHTON.]

Chichester. [CHICHESTER.]

Cuckfield, a market-town, 12 miles N. from Brighton, is a small neat place. The church is large, and of decorated English architecture. There is a free grammar-school, with a small endowment. Population of the parish, 3444.

East Bourn, a bathing place, 14 miles E.S.E. from Lewes, by the South Coast Railway and East Bourn branch, is pleasantly situated a short distance from the coast, near Beachy Head, and at the foot of the eastern extremity of the South Downs. The parish church is large, with nave and aisles, chancel, and an antique tower; a neat district church has also been recently erected. The surrounding country is finely wooded. The sands are dry and extensive, and the bathing very convenient. Population of the parish, 3015; but the town has greatly increased since the last census.

East Grinstead, a market-town, 16 miles N. by W. from Lewes, is situated on an eminence, and consists of one principal street irregularly built. The church is a handsome gothic building, with an embattled tower. The town contains a quadrangular building called the College, which has separate apartments for 24 aged persons, who have an allowance of 8*l.* a year each, and there is also a free grammar-school. East Grinstead was a parliamentary borough, but was disfranchised by the Reform Act. Population of the parish, 3586.

Hailsham, a market-town, 11 miles E. from Lewes, stands on a gentle acclivity. The town is small, but the market, which is every alternate Wednesday for sheep and cattle, is one of the largest in Sussex. Population of the parish, 1586.

Hastings, a parliamentary borough, 24½ miles E. from Lewes by the South Coast Railway, is situated on the coast in a hollow sheltered on all sides except the south by hills. The town consists of two principal streets, between which a small stream called the Bourn flows into the sea. The town contains a town-hall, a gaol, two ancient churches, and several hotels. Hastings is much resorted to as a bathing place, and about a mile W. from it is the new and handsome town of *St. Leonards*, which is also frequented as a bathing place. The parliamentary borough returns 2 members. Population, 11,617.

Horsham, a market-town and parliamentary borough, 21 miles N.W. by W. from Lewes, consists of two streets crossing each other at right angles, with an open space in the centre, in which stands the court-house, a handsome stone building. The town also contains a county gaol. The church is a spacious and elegant building, with a

lofty tower surmounted by a spire, in the early English style of architecture. The parliamentary borough returns 1 member. Population, 5765.

Lewes, a market-town, parliamentary borough, and the capital of the county, 8 miles N.E. by E. from Brighton by the South Coast Railway, is situated chiefly on the W. bank of the Ouse, on one of the ridges of the South Downs, and partly on the level ground of the E. bank. The houses are generally well built, and the streets paved, and lighted with gas. The principal public buildings are the town-hall, the house of correction, the churches, and a free grammar-school. The ruins of Lewes Castle occupy an elevated site on the north side of the town, and the top of the keep affords an extensive prospect of the surrounding country. The Ouse is navigable from the harbour of Newhaven without locks 2 miles beyond Lewes, and with locks 10 miles farther up, altogether 18 miles. The parliamentary borough returns 2 members. Population, 9282.

Mayfield, a small town, 15 miles N.E. from Lewes, has some remains of a large palace, which belonged to the archbishops of Canterbury. The church is a large building with a lofty spire. Population of the parish, 2943.

Midhurst, a market-town and parliamentary borough, 6 miles W. from Petworth, is situated on a gentle eminence on the S.E. bank of the Western Rother. It contains a town-hall and a small church of later English architecture. The ruins of Cowdry House, which was burnt down in 1793, are in Cowdry Park, near the town, on the east. The parliamentary borough, which returns 1 member, includes several other parishes and parts of parishes adjoining. Population of the parish of Midhurst, 1536; of the parliamentary borough, 6578.

Newhaven, a village and a harbour, 8 miles S. from Lewes, is situated at the mouth of the Ouse. The village stands on the W. side of the river, and one mile from the sea. The harbour is the sole cause of its importance, and is much frequented. The river is crossed by a drawbridge, erected in 1784. There is a custom-house. The chief imports consist of coals, timber, corn, wine, and spirits. The exports are very limited, most of the vessels going out in ballast. Steamers sometimes go from Newhaven to Dieppe, which is the shortest route from London to Paris. The church stands on a hill to the west of the town: the nave is modern, but the round eastern wall of the chancel is thought to be Saxon. The ancient name of the town was Meeching, but when the channel of the Ouse was diverted from Seaford and made to enter the sea in a straight line southward, the old name was changed. Population of the town, 955.

Petworth, a market-town, 10 miles N. by W. from Arundel, is situated on an eminence about a mile N. from the Western Rother, and above a small stream, from which it is supplied with water, raised by works erected by the late Earl of Egremont. There is a court-house in the market-place in the centre of the town, and there is a house of correction. The church was erected about the time of Henry VII, and is a cruciform structure in the decorated style, to which an elegant spire has been added. It has been repaired and decorated with windows of painted glass, and contains a large statue of the late Earl of Egremont. Population of the parish, 3364.

Pevensey, a small village, formerly a harbour, is 16 miles S.E. by E. from Lewes by the South Coast Railway. The port was important in the Saxon and Norman times, but the sea gradually retired, and the harbour is now filled up. There are ruins of Pevensey Castle, which formerly protected the port. It seems to have been built with some of the materials of a Roman fortress. The outer walls, which contain many Roman bricks, enclose a space of seven acres, and are from 20 to 25 feet high. The moat on the south side is still wide and deep; on the other side it has been filled up. The entrance is on the west or land side, between two round towers, over a drawbridge. Within the walls is another and much more modern fortification, approaching a pentagonal form, with five nearly circular towers, moated on the north and west. It is entered from the outer court by a drawbridge on the west side between two towers. The principal barbican or watch-tower is not at the entrance, but towards the N.E. corner. The walls are 9 feet thick, and the towers were two and three stories in height. The castle was of great strength. Population of the village, 323.

Rye, a municipal borough, parliamentary borough, and seaport, is situated at the eastern corner of the county, on the west bank of the Rother, which here falls into the sea by an æstuary. The condition of Rye has mainly depended upon its harbour, which in the 16th century was nearly choked up: an act was passed in 1548 for amending the haven, yet it was not till the storm of 1570 re-opened it that the harbour was navigable for trading vessels. The sea however continued to recede, and the bar of beach accumulated at the entrance, till, in 1750, all hopes of improving the old harbour being abandoned, it was determined to form a new mouth by a canal running directly south into the sea; this work was prosecuted at a great expense till 1778, when the new harbour was found to be a complete failure, and was abandoned. The old harbour was once more resorted to, and it has been much improved. The average rise of spring-tides is about 17 feet, and of neap-tides from 9 to 12 feet at the pier-head, whilst the lift in the bay is 22 feet. At low-water the harbour is dry. The depth of the channel up the river decreases gradually to the town, where there is 14 feet of water at spring-tides, but during neaps seldom more than 9 feet. The approach from the bay to the entrance of the harbour is very intricate and difficult, especially for sailing vessels, owing to the sand-banks and the tortuous course of the channel. The chief trade consists in the export of hops, bark, and wool, and in the import of coals, corn, timber, and Dutch produce. The town consists of three principal streets intersected by cross streets, and the houses are irregularly built. The town contains a town-hall, gaol, parish church, and free grammar-school. The municipal borough is governed by 4 aldermen and 12 councillors: popu-

lation, 4031. The parliamentary borough returns 1 member: population, 7667.

Seaford, a small fishing village, 10 miles S. by E. from Lewes, was formerly the port where the river Ouse emptied itself into the sea, but the great storm of 1570, which diverted the channel of the Rother, made a fresh mouth for the Ouse by breaking through the beach, and forming what is now called the Old Harbour, which was used till a new channel was formed for the Ouse at Newhaven. The parish church is ancient. Population of the parish, 953.

Shoreham, or *New Shoreham*, a parliamentary borough and seaport, 6 miles W. from Brighton by the South Coast Railway, is situated in a level tract at the mouth of the Adur. It was an important harbour in the Norman times, but it was gradually choked up by shingle. In 1816 the harbour was improved by cutting an artificial channel through the shingle embankment and the erection of substantial piers. Shoreham is the harbour for Brighton, and has also a considerable trade of its own, being a warehousing port for all descriptions of timber, and for various other kinds of foreign produce. The town is irregularly built, and the houses are for the most part old. The church is very ancient, and is still large, though the nave has been destroyed. Population of the parish, 1998. The parliamentary borough, which includes the whole of the rape of Bramber except Horsham, returns 2 members: population, 27,980.

Steyning, a market-town, 10 miles N.W. by W. from Brighton, stands at the foot of an escarpment of the South Downs, about a mile W. from the Adur, and consists of a wide street running N.W., from which branches another running N.E. Of the original church only the nave remains, which is early Norman; the rest is modern. Steyning was formerly a borough, but was disfranchised by the Reform Act. Population of the parish, 1495.

Uckfield, a village, 8 miles N.N.E. from Lewes, stands on the road from Lewes to Tunbridge Wells, in a very rich and finely-wooded district, with many gentlemen's seats in the neighbourhood. Population of the parish, 1534.

Winchelsea, or *New Winchelsea*, 2½ miles S.W. from Rye, is one of the Cinque Ports. Old Winchelsea was much injured by encroachments of the sea, especially in 1250, when 300 houses were destroyed. New Winchelsea was commenced 2 miles to the west, and the population were gradually removing to it, when in 1287 the sea entirely destroyed the old town. The new town gradually became an important place, its harbour being one of the chief ports of embarkation for the continent. Queen Elizabeth, when she passed through it in 1573, styled it 'Little London;' but a sandbank formed to the west of it, and the sea gradually retired, and Winchelsea is now a village, separated from the sea by nearly two miles of sand. There are many interesting remains of the old town in the present town and neighbourhood, especially the church, which is partly in ruins. Population of the parish, 687.

Worthing, a modern bathing-town, 11 miles W. from Brighton by the South Coast Railway, is well-built, with convenient but not large houses. The Esplanade extends nearly a mile along the shore. It has a chapel of ease built in 1812. Population of the town, 4702.

History and Antiquities.—This county derives its name from the kingdom erected by Ella, after his successful expedition in 477, when he assumed the title of king of the South Saxons, and gave the title of Suth-Sex to the district.

In A.D. 47, when Vespasian received his commission to reduce the maritime districts, Sussex fell under the Roman sway. This being accomplished, he left the government to a British prince, named Cogidubnus, who, if he did not found the city of Chichester, made it the chief seat of his government, which included Hampshire and Sussex.

The Romans however being now supreme, three large towns or fortresses sprung up along the coasts of Sussex, Regnum (Chichester), Mutuantonis, most probably Lewes, and Anderida, of which the site is doubtful.

Ella, when he came to Sussex, had three sons with him, but two of these were probably slain in battle, for he was succeeded in his kingdom by his third son Cissa. This kingdom was bounded on the N. by the river Thames, on the E. by the newly-established kindom of Hengist in Kent, on the S. by the sea, and on the W. by the Britons, still in possession of Hants and Berks. The kingdom of Wessex had been long extending its power over the other Anglo-Saxon kingdoms; and Egbert, having defeated the Mercians in 823, despatched a force into Kent, under his son Ethelwolf, and Alstan, bishop of Sherburn. The ruling prince, Baldred, fled, and from this time Sussex, with Surrey and Kent, and probably a part of Essex, was a subordinate portion of the West Saxon kingdom. King Alfred made his residence occasionally in Sussex, and built several castles for the protection of the coast. In the time of Edward the Confessor, Sussex with Kent was included in the earldom of the famous Godwin, who had become one of the most potent subjects in the kingdom, and exercised within his earldom vice-regal power. William the Conqueror landed with his army, Sept. 28, 1066, in Pevensey Bay, near the mouth of the little river Asten. The decisive battle of Hastings was fought on the 14th of October following, at a spot about nine miles from the place of landing, on a heath then called Epiton, but which thenceforth assumed the name of Battle.

Of ancient castellated edifices, besides those noticed in describing the towns, the most remarkable are Amberley, Bodiam, and Herstmonceux, and the castellated mansions of Eridge, Knep, and Scotney. Amberley Castle is situated on the east side of the Arun, 4 miles from Arundel. The gateway is still standing. Bodiam Castle is 4 miles from Robertsbridge, on the Rother, at the extreme eastern side of the county. It was built in 1386. The site forms nearly a square, with four round towers at the angles, and three square ones between them; the great gateway is flanked by two square towers, and the entrance is defended by a machicolation and portcullis. The fortress is surrounded by a very broad moat, which is sup-

plied with water artificially conducted from the Rother, and assumes the appearance of a small lake. The interior was fitted up for a baronial residence. The castle of Herstmonceux is only of a few years later date. It is one of the oldest brick buildings in England. Knep Castle is near Horsham: it is a modern castellated building in the gothic style. Scotney Castle is on the Kent Ditch: the stream which divides the two counties runs through the centre of the castle. It was built by a family of this name about the time of Stephen. At each angle was a round machicolated tower, but the southern only remains. The whole was surrounded by a moat.

Of monastic remains the principal are the mitred abbey of Battle, the abbeys of Bayham and Robertsbridge, and the priory of St. Pancras at Lewes. The Knights Templars had a preceptory at Sedlescombe, near Battle.

SUSSEX, AUGUSTUS FREDERICK, DUKE OF, the sixth son of George III., was born Jan. 27, 1773. After having been some time under a private tutor, he travelled abroad, and studied at Göttingen. In April, 1793, he was privately married at Rome to the Lady Augusta Murray, daughter of the Earl of Dunmore. The ceremony was repeated in St. George's, Hanover Square, London, Dec. 5, 1793, but the validity of this union was questioned under the Royal Marriage Act, 12 Geo. III., c. 3, which prohibits every descendant of George III. from contracting matrimony without the consent of the crown. There is no doubt that, so far as respected England, the English marriage came under this act. But there were reasons for supposing that the marriage at Rome might be capable of being declared valid in other parts of the kingdom, of which the Duke, as a prince of the blood, was as much a citizen as he was of England. It was supposed that the question might come to be considered in relation to the succession to the throne of Hanover. His first wife having died in 1834, he married in 1840 the widow of Sir George Buggin. On Nov. 30, 1830, after a pretty warm contest, he became President of the Royal Society. He was a great friend of literature and art, and a warm supporter of every liberal measure in politics. His manners were popular, and his disposition kind. He was a collector of rare books, and left behind him a magnificent library. It consisted in 1827 of 50,000 volumes, 14,000 of which were theological. He died at Kensington Palace, April 21, 1843, and was buried in Kensall Green Cemetery.

SUSTERMANS, JUSTUS, was born at Antwerp in 1597. He was the pupil of William de Vos. He lived chiefly in Florence, where he was court painter to the Grand-Duke Cosmo II. He was favoured also by Ferdinand II., whose portrait he painted. His master-piece is a picture of the Florentine nobility swearing allegiance to Ferdinand upon his succession. He died at Florence in 1681. There are several portraits by him in the Pitti Palace at Florence.

SUTHERLAND, an extensive county in the north of Scotland, is bounded N. by the North Sea, E. by the North Sea and Caithness, W. by the Minch, and S. by Ross and Cromarty. The length in straight lines varies from 60 to 42 miles, and the breadth from 54 to 42 miles. It lies between 57° 55′ and 58° 37′ N. lat., and 3° 43′ and 5° 23′ 30″ W. long. The area is 1903 square miles. The population in 1841 was 24,782.

There are no islands along the east coast of Sutherland, but there is a number of small islands along the west and north coasts, of which four are inhabited. Oldany, Calva, and Handa, are the largest of these islands on the west coast. Along the north coast, the lofty peaks of the Stack and Skerries islands, belonging to this county, are conspicuous in clear weather at a distance of some miles from the coast. Island Hoan, the Rabbit Islands, Island Roan, and Island Neave, or Holy Island, are situate close to the coast, and form, in some instances, natural breakwaters, and afford protection for shipping.

Sutherland is a mountainous and pastoral district. The whole of the interior of the county consists of a sucession of mountains and ranges of hills, and some extensive moors, broken and separated by several straths and mountain glens, diverging from the principal valleys, which open towards the sea-coasts. Among these mountain-ranges one of great altitude, which contains several mountains among the highest in Great Britain, separates the west and north coasts of the county from its southern shore and valleys, and runs in a line nearly parallel with the trending of the indented shores of the Atlantic and North Seas. The detached and conical mountain of Suilven, in Assynt, forms the characteristic and picturesque southern pillar of this lofty range; while Ben More of Assynt, which attains an elevation of 3431 feet, and other mountains, mark with their towering summits the prolongation of this range to within a few miles of the North Sea. The alpine character of this extensive range is also preserved in the magnitude of many lakes at the base of the mountains, in the depth and abruptness of the openings and passes, in the expansion of widely-spread mountain sides and formidable mosses and bogs, and in a variety of romantic valleys and rugged glens and hollows. The western and northern districts of the county, thus separated by the mountains of the interior from the southern and eastern parts, are remarkable for the general ruggedness and inequalities of the surface, and for the vast number of rocky eminences and of second-rate lakes which characterise the district. Along the north-coast the same description of country continues, but in a more modified form. The sea-coasts of these two districts also present headlands, promontories, and numerous cliffs of the boldest description. In contrast to these striking and distinguishing features of the west and north divisions of the county, the eastern and southern districts are marked by several extensive and pleasant valleys, by less elevated hills, by rich pasturage, and by valuable tracts of arable land in a high state of cultivation. The sea-coast along the eastern shore is in general flat and sandy.

This county is abundantly watered by many rivers and their tributary streams, partly flowing

from extensive inland lakes, and partly formed by the junction of innumerable mountain-streams. All these rivers have their source, supplies, and auxiliary streams within the county of Sutherland, with the single exception of the subordinate streams of the Eanack and Carron, which flow through the county of Ross before joining the æstuary of the Oykill. The salmon-fishing of the larger rivers is very valuable; but with the exception of the intricate and narrow channel of the Frith of Dornoch and the short æstuary of the Fleet, none of the rivers are sufficiently large to be navigable. The Oykill is the chief river of the county: its source is in Loch Aish, a picturesque lake to the east of Ben More of Assynt. The Oykill forms the boundary between the two counties of Ross and Sutherland, and, after being augmented by the Eanack, Cassley, Shin, and Carron, expands into an æstuary, the ancient Portnaculter, but now generally called, at its mouth between Tarbetness and Embo, the Dornoch Frith, and, above the town of Tain, the Kyle of Sutherland. The river Shin, which flows from a lake of the same name, has a course of six miles before it joins the Oykill, and is the most important salmon river in the county. The other important rivers in the county are the Cassley, which joins the Oykill; the Fleet, which opens into a small æstuary, formerly known as Unes, and now as the Little Ferry; and the Brora and Hemsdale, both of which enter the Moray Frith. The river Halladale, the Strathy, the Naver, the Torrisdale, the Hope, and Dionard, all flow into the North Sea; and the Inchard, Laxford, Inver, and Kirkaig, enter the Atlantic on the west-coast.

The interior and western districts of Sutherland are remarkable for the great number of fresh-water lakes, which in general lie at the base of the higher mountains, or occupy the hollow spaces, in the rocks and mosses of the rocky western coast. Loch Shin, with the almost connected smaller lake called Loch Griam, is 18 miles in a straight line, and forms the largest of a singular chain of lakes, which with the exception of a few miles between each of them, extends from near the head of the Dornoch Frith on the east coast to Loch Laxford, a salt-water loch of the Atlantic on the west-coast. Loch Assynt, another sheet of water, surrounded by some of the highest and most picturesque mountains of the county, is the largest lake along the west coast.

The rocks of the interior of Sutherland and a considerable portion of the west coast are gneiss. Detached districts, chiefly on the confines of Caithness, exhibit great masses of granite, and the high hills of Loth are composed of porphyritic granite of different colours, yellow, reddish-brown, and gray. Sienite abounds on the north shore of Loch Shin, and also large rocks of granular marble. The parish of Assynt also contains extensive masses of white marble, and many of the high hills in that district are of quartz. The other prevailing rocks are red sandstone, limestone, conglomerate, oolite sandstone of a beautifully white and fine-grained variety, and sandstone flag. Coal is also found in some places.

Sutherland has a variable climate, but along the sheltered east coast it is mild and salubrious. The high parts of the interior and the west coast are subject to continued and heavy falls of rain, the injurious effects of which to the human constitution appear however to be counteracted by the purity and invigorating quality of the mountain and sea breezes. The valleys are in general well sheltered and cheerful; but in July and August they are often oppressively warm and sultry; and this heat along the west and north coasts fills the air with gnats, which in calm weather harass men and cattle so much as to render outdoor work during the heat of the day almost intolerable.

The arable land of Sutherland lies principally close to and along the east coast; and there the most improved system of Scottish husbandry is carefully acted upon. The Dunrobin breed of Highland cattle belongs to this county, and is well known, and eagerly purchased in the southern counties. Sheep of the pure Cheviot breed are by far the most important stock, and the staple produce of the Sutherland high grounds. The interior uplands and some of the valleys are divided into extensive sheep-farms, which are well stocked; but in summer and autumn, and during a portion of the spring season, they could support a much greater number of sheep, provided a supply of winter food could be depended upon.

In most of the valleys, natural woods of birch, alder, and occasionally oak, adorn the steep sides and water edges; but the extensive forests of Scottish pines that, at a remote period, covered the greater part of the interior of this county, have long ago totally disappeared. The extent of planted wood of full growth is not great; but very extensive plantations of fir, larch, and other forest trees, have been made of late years.

Several parts of this county have been celebrated for centuries as deer forests; and there the red deer are still found in great numbers, and of a size and weight not equalled in any other part of Scotland. Roe deer are also common in the woods; and game of all kinds, being protected, is abundant in all parts of the county. The county has no manufactures; but that valuable and natural branch of industry, the fisheries, is prosecuted with vigour and success. The village of *Helmsdale* has arisen, from a hamlet of three or four cottages, within the last forty years, to a bustling, industrious, and prosperous village, with all the means of future increase and success, from the active prosecution of the herring fishery.

Formed roads were only commenced in this county in the year 1811; and since that period the whole circuit of the county of Sutherland has been provided with roads of the best construction, and numerous bridges, embankments, and mounds necessary to connect and complete them.

Sutherland returns one member to parliament. *Dornoch* is the only burgh within the county, and joins with Wick, Kirkwall, Tain, Cromarty, and Dingwall, in returning a member to parliament. It was anciently the seat of the bishops of Caithness, part of whose palace is still entire, and used for county purposes; and the old cathedral of the diocese, which stood here, after being burnt during

the feuds of the 16th century, and repaired at different subsequent periods, has been ultimately rebuilt in its present handsome form. Dornoch derived its origin from being the seat of the bishopric: being without trade or manufactures, it is a small town, and important only as being the county town. The population of the burgh in 1841 was 451. The larger villages of the county are Helmsdale, Brora, Golspie, and Bonar.

The antiquities of Sutherland consist principally of rude structures of ages so remote as to be lost even to tradition, but which, if closely studied, might be interesting in relation to the period of the Pictish kingdom in Scotland. Upright stones, tumuli, stone battle-axes, and old battle-fields have reference to the invasions of the Danes; and the foundations and ruins of old towers and strongholds attest the existence of feudal usages.

At the earliest period of Scottish history the Thanes of Sutherland figure conspicuously in the transactions of the kingdom, and in the 13th century their descendants appear as Earls of Sutherland; and the succession of this ancient family has continued in unbroken descent down to the present Duke of Sutherland, who represents the family through the female branch.

SUTLEGE. [HINDUSTAN, vii. 212.]

SUTTEE (*Satí*, from the Sanscrit *sat*, good), properly means a chaste and virtuous wife, and in ordinary use is applied to one who burns herself on her husband's funeral pile. The term has subsequently been employed by Europeans to denote the act of self-immolation as practised by Hindoo widows. When this practice was first introduced cannot be determined with any degree of certainty: it is described by the Greek writers of the age of Alexander, and by Mohammedan and Christian travellers of the 16th and 17th centuries. Diodorus (xix. 33) gives an instance of a Suttee which occurred in the army of Eumenes upwards of 300 years before the *Christian* æra; and he ascribes the zeal for this kind of self-sacrifice, in most instances, to the infamy which attached to those widows who refused to conform to the custom. This is also the view taken by our missionaries.

From returns published in a parliamenatry paper ('Hindoo Widows,' 178, sess. 1830), it appears that the numbers who were burned or buried alive in the presidency of Bengal was 583 in 1822, 575 in 1823, 572 in 1824, 639 in 1825, and 518 in 1826. In the presidency of Bombay the number was 158 for the four years ending 1827. No return is given from the Madras presidency.

In 1829 a regulation was passed, Dec. 14, by the governor-general, Lord W. Bentinck, in council, consisting of Lord Combermere, W. B. Bailey, and C. T. Metcalfe, declaring the practice of Suttee, or of burning or burying alive the widows of Hindoos, to be illegal, and punishable by the criminal courts.

SUTTON-IN-ASHFIELD. [NOTTINGHAMSHIRE.

SUTURE, in Surgery, is the method of sewing together the edges of wounds; and the term is also applied to the threads with which the operation is effected.

The only wounds in which the application of sutures can be beneficial are those of which the edges, if held together, are likely to unite. They are therefore improper in all contused wounds, in the majority of lacerations, and in those wounds which extend so deep that, though the superficial parts might be brought together, the deep ones would remain open. But in cleanly-cut wounds, whose edges can be placed and kept in contact without any painful stretching of the parts adjacent to them, sutures are, if applied with proper cautions, by far the most convenient and secure method of obtaining a speedy reunion.

SUWARROW. *Suvórov-Rymnikski, Alexander Vassilyevich, Count, Prince Italinski*, was born in Finland, Nov. 13, 1730. The father of Suvórov, who had distinguished himself in the army, placed his son in that profession at the age of thirteen years. He obtained a lieutenancy in a regiment of the line, was raised to the rank of first-lieutenant three years afterwards, and in 1758, when the war with Prussia broke out, he was entrusted with the command of the garrison of Memel. But he then begged to be sent on active service. His petition was granted, and in 1759 he was present at the battle of Kunnersdorf. He continued a first-lieutenant until the death of the Empress Elizabeth, when the Russian troops were recalled from Prussia. Catherine II., in 1763, named him colonel of the Astrakhan regiment of infantry. Five years afterwards he was commanding officer of a part of the Russian troops which were engaged in warfare with the confederation of Bary in Poland. Here he obtained so many advantages over the enemy, that the success of the campaign has chiefly been attributed to him. On his return he was made major-general, and in 1773 he was sent against the Turks under Field-marshal Rumyanstow. Three victories by Suvórov over the troops of Mustapha III. prepared for the complete defeat of the Turks, and having effected a junction with the army of General Kamenskoy, a fourth victory, June, 1774, put an end to the contest. In the meantime Pugacheff, a Cossack of the Don, who pretended that he was Peter III., had assembled a numerous army. A formidable insurrection threatened to overthrow the throne of Catherine; the negociations with the Ottoman Porte had scarcely terminated when Suvórov was ordered to meet the insurgents. He settled the troubles, and soon restored perfect tranquillity to the empire. In 1783 he subjugated the Cuban Tartars and those of Budziac, and was raised to the chief command, which he held throughout the second Turkish war, which broke out in 1787. He sacrificed a great many lives, but he cannot be charged with not exposing his own. Indeed his courage frequently led him into difficulties which he might have avoided, as at the siege of Oczakow (Dec. 17, 1788), where he would have been irretrievably lost, if Prince Repnin had not come to his assistance. The celebrated battle of Fokshany, which took place Aug. 1, 1789, between the Seraskier Mehmet Pasha and the Prince of Coburg, who commanded a part of the Russian army, was chiefly won through Suvórov's intrepidity. In

Sept. of the same year the Prince of Coburg was surrounded by the Turks; and the Russian army stationed on the river Rymnik was in imminent danger. Suvórov reached the spot with a comparatively small force; the armies met Sept. 22, and the Turks were completely defeated. It was for this victory that the Emperor Joseph II. raised him to the rank of count of the empire, and Catherine to the dignity of a Russian count with the name of Rymnikski.

The fortress of Ismail, which had in the course of this war withstood repeated attacks from the Russian armies, was next taken by storm by Suvórov. Thirty-three thousand Turks were killed or severely wounded, and ten thousand were made prisoners after the slaughter had ceased. Eight days were required for burying the dead. Suvórov took a horse to supply the place of the one he had lost in the action, and this was all the share he had in the booty.

In 1792, when peace was made between Russia and the Porte at Yassy in Moldavia (Jan. 9), the Empress Catherine appointed Suvórov governor-general of the province of Yekaterinoslaw, the Crimea, and the lately-acquired provinces round the mouth of the Dniester. In 1794, when the Poles revolted, Suvórov was sent against them. He gained several victories over the insurgents, and the storming of Praga, which was taken after a desperate fight of four hours, and which opened to him the gates of Warsaw, Nov. 9, reduced the Poles to obedience. On this occasion Catherine made him a field-marshal, and bestowed upon him many valuable presents.

In 1799, after the death of Catherine, the Emperor Paul gave him the command of the troops which fought in Italy against the French. His brilliant victories, as those of Piacenza, Novi, and Alessandria, and the activity with which he took from the French all the towns of Upper Italy, procured him the title of Prince Italinski. Some reverses caused by the behaviour of the Austrian army, together with the apathy of the court of Vienna, roused the indignation of Paul, and he recalled his forces. Scarcely however had Suvórov arrived in Russia, when illness obliged him to stay at his country-seat in Lithuania. The Emperor's own surgeon was dispatched to him. Yet in the midst of preparations which he had made for Suvórov's triumphal entry into St. Peterburg, Paul changed his mind. Suvórov learnt in Riga that he was in disgrace; nevertheless he continued his journey to St. Petersburg, and in sixteen days after his arrival, Nov. 18, 1800, Suvórov died. The Emperor Alexander erected in St. Petersburg, in 1801, a colossal statue of him.

SUZOOS, a tribe which occupies the territory along the coast of Western Africa, from the Rio Pongas to the neighbourhood of the Great Scarcies River. The Bagoes, who were once masters of the whole of the Rio Pongas and of the country between that river and the Rio Nunez, as well as of a considerable line of sea-coast extending from the Rio Nunez southward to the river Dembia, opposite the Isles de Los, were conquered by the Suzoos, but still retain a few villages, chiefly on the coast and the islands, upon the largest of which (Tamara) they have plantations and villages. The Suzoo capital is Kanoffee, upon the river Pongas. The Suzoos are under a chief or king, but all matters of much importance are debated and concluded in a council, whose decisions are however inoperative if the king withholds his consent. The Suzoos are mostly pagans, although Mohammedanism has been making progress among them, through the example and exertions of the Mandingoes. The Suzoo language is to the ear the most agreeable of the African dialects; it is spoken throughout a considerable space near the coast, and is understood by the Foulahs, Mandingoes, Bulloms, and Timannees.

SVENDBORG. [FÜNEN.]

SWAFFHAM. [NORFOLK.]

SWALLOWS, *Hirundinidæ*, a family of Insectivorous birds (tribe *Fissirostres*), in which the powers of flight are very highly developed, while the feet are short and small, and but little adapted for terrestrial progression.

The *Hirundinidæ* are very widely diffused, and everywhere appear to be more or less decidedly migratory, especially in latitudes where a supply of insect food (taken on the wing) fails towards the middle of autumn.

The *Hirundinidæ* are resolvable into two subfamilies, namely the Swifts (*Cypselinæ*) and the Swallows (*Hirundininæ*).

The European species of this family are the Swift (*Cypselus Apus, Cypselus murarius*, Temm.), the White-Bellied or Great Gibraltar Swift (*Cypselus Melba, Cypselus alpinus*, Temm.), the Rock-Martin (*Hirundo rupestris*), the Rufous Swallow (*Hirundo rufula*, Temm.), the Chimney Swallow (*Hirundo rustica*, Linn.), the Martin (*Hirundo urbica*, Linn.), and the Sand-Martin (*Hirundo riparia*, Linn.). Of these the first and the last three are British (summer visitors); and of the second, three specimens have been killed, and one found dead in Britain.

Mr. Gould, in the Introduction to his 'Birds of Australia,' speaking of an Australian Swift (*Acanthylis caudacuta*), observes, that it is 'a migratory bird in most parts of Australia, but whence it comes, or whither it goes, has not yet been ascertained; of its nidification also nothing is known. I have alluded to the great wing-powers of the birds of the genus *Acanthylis*, and in illustration I may mention, that an individual of this species was killed in England during the past year (1847). It would be interesting to know the route it pursued in travelling from so great a distance, as it must have done.'

For an account of the British *Hirundinidæ*, see Selby, Gould, Bewick, Yarrell, and other writers on British ornithology. The Swift, the Swallow, the Martin, and the Sand-Martin are familiar to all.

Among the Asiatic *Hirundinidæ*, we may notice the *Macropteryx longipennis*, the *Hirundo esculenta*, and the *Hirundo fusiphaga*, which latter two form in deep caverns the edible nests so highly prized as delicacies by the Chinese. These nests are a sort of isinglass, and are probably formed of an inspissated gelatinous secretion,

poured out in the crop of the bird. Perhaps a gelatinous secretion binds together the mud of which the nests of our common House Martin are constructed, and which, under shelter, last with a little repair from year to year.

Of the African Swallows, we may adduce the *Hirundo Senegalensis* as an example.

The American Swallows are represented by the *Chætura macroptera* (Long-Winged Swift),

Long-Winged Swift (*Chætura macroptera*).

Progne purpurea (Purple Martin), *Hirundo Americana* (American Barn Swallow), and many others, admirably described in the works of Nuttall, Wilson, Audubon, &c. See also Bonaparte's 'Birds of Europe and North America.' He enumerates eight North American species.

Of the Australian *Hirundinidæ*, Mr. Gould describes and figures one species of *Acanthylis*, one of *Cypselus*, one of *Atticora* (the members of which are principally American), one of *Hirundo* (the representative of our Common Swallow), and two of *Chelidon* (represented by others in Europe, Asia, Africa, and America).

Mr. G. R. Gray divides the *Fissirostres* into two subtribes:—1, *Fissirostres Nocturnæ*, consisting of the family *Caprimulgidæ*, with its subfamilies; and, 2, *Fissirostres Diurnæ*, the first family of which last subtribe is *Hirundinidæ*, with the following subfamilies:—

1. *Cypselinæ*.

Genera:—*Cypselus, Macropteryx, Hemiprocnes, Acanthylis, Collocalia.*

2. *Hirundininæ*.

Genera:—*Hirundo, Progne, Cotyle, Chelidon.*

SWAMMERDAM, JOHN, was born at Amsterdam in 1637. He was originally intended for the church, but he preferred medicine. During his preparatory studies, following the example of his father, who was celebrated for his large collection of objects of natural history, he devoted himself with great ardour to the study of that science, devoting himself especially to insects. In 1651 he went to Leyden, and studied under Van Horne and Francis Sylvius. After two years' study he went to Saumur in France, and in 1664 discovered the valves of the lymphatics, but Ruysch had at the same time made similar observations. From Saumur Swammerdam went to Paris, and thence to Amsterdam. In 1666, after a second visit to Paris, he went again to Leyden, and made numerous anatomical researches in company with Van Horne. Early in the following year he first employed the method of preparing the blood-vessels by means of waxen injections, and was soon after admitted doctor of medicine: his thesis was an essay on respiration. About this time also he invented the method of making dry preparations of hollow organs, which is now usually employed.

After receiving his diploma Swammerdam devoted his time chiefly to the study of insects; and in 1669 he first published his general history of them. In 1672 he was engaged in numerous dissections of fishes, especially of their glands; and made several useful investigations respecting the pancreatic fluid. In 1673 he published his treatise on the natural history of bees; but the labour and the fatigue to which his investigations had occasioned destroyed his health, and he determined to sell his museum. It was not easy however to find a purchaser for so extensive a collection; and while various negociations were pending, he completed the arrangement of his museum, and made catalogues of it. In 1675 he published his last work, The 'Anatomy of the Day-Fly.' His various anxieties at length brought on a severe illness, and he died early in 1681.

Swammerdam left all his manuscripts on insects to Thévenot. They were afterwards bought by Boerhaave, and published in one volume. His heirs endeavoured to obtain 5000 florins for his museum, but in vain; and it was at length broken up, and sold in small portions.

SWAN RIVER. [Western Australia.]

SWANEVELT, HERMANN VAN, was born in 1618 or 1620, at Woerden. He went very young to Italy, where he became a pupil of Claude Lorraine, and soon proved himself worthy of so great a master. He was unremitting in his study of nature, and his retired way of life caused him to be called 'the hermit,' by which name he became generally known.

Swanevelt's pictures have the sweetness and tenderness of Claude, but they want his warmth, and are less striking in their effect; but his figures both of men and animals are superior to those of Claude. His paintings are excessively rare, as well as his drawings. Dr. Waagen mentions only a single picture by Swanevelt in England. This was at Luton House, in the collection of the Marquis of Bute. The time of his death, which took place at Rome, is rather uncertain; it was most probably in 1680.

SWANS, a subfamily of web-footed birds, belonging to the family *Anatidæ*, order *Anseres* of Linnæus.

For a general notion of the position of the subfamily *Cygninæ*, genus *Cygnus*, Meyer, the articles Ducks, Fuligulinæ, and Goose, should be consulted.

The peculiarities of organisation in this subfamily deserving of notice are the great length of the neck, consisting of 23 vertebræ, and the

cavity in the sternum for the reception of a considerable portion of the trachea, reflected back, and doubling upon itself before entering the chest.

Generic Character of Cygnus.—Beak of equal breadth throughout its length; higher than wide at the base; depressed at the point; both mandibles furnished along the sides with transverse serrated lamellæ. Nostrils oblong, lateral, near the middle of the beak. Neck slender and very long. Legs short; the hind toe small and free.

The genus *Cygnus* is extensively distributed, and the species are migratory in their habits. They take up their abode along the margin of large rivers, lakes, and sheets of water, raising a high nest of accumulated vegetable matters, so as to be secure in times of floods, or during the tidal influx. The young, or Cygnets, are of a brownish-gray, the pure white colour not being acquired until the beginning of the third year. To this rule however, one species, the *Cygnus immutabilis* of Yarrell, is an exception, the young being white like the adults.

Swans of Europe and Asia.

1. The Wild Swan, *Cygnus ferus*, Ray. This is the *Cygnus musicus* of Bechstein, and, as there are now more than one wild species well defined, the Prince of Canino and others adopt that specific name, instead of the original *ferus;* but the propriety of this may be doubted. It is the *Cygne Sauvage* of the French; *Cigno* and *Cigno Salvatico* of the Italians; *Singschwan* and *Nordöstliche Singschwan* of the Germans; and *Hooper, Elk*, and *Whistling Swan* of the British.

Geographical Distribution.—Northern regions of Europe and Asia, residing in summer within the arctic circle, Iceland, Scandinavia. Winter visitor to the British Islands (where however it has been known to breed in the Shetland and Orkney Islands and in Sutherland), Holland, France, Provence, and Italy, and, according to Mr. Bennett, going as far south as Barbary and Egypt. Eastward it extends as far as Japan. This species is in all probability the swan so much celebrated by the ancient poets for its dying song.

Habits, &c.—The note of this wild swan resembles the word 'hoop' uttered several times successively. They fly in a wedge-like figure, uttering this note as they proceed, and when heard from above it is not unmusical. This intonation arises from the length and duplicature of the trachea in the sternal chamber. (See Yarrell in 'Mag. of Nat. Hist.' for 1839.) The food consists of aquatic plants and insects. It breeds in captivity.

2. *Cygnus Bewickii*, Yarrell. This species differs in the structure of the trachea, and in several external characters from the preceding, and is altogether a much smaller bird.

Bewick's Swan is a native of the northern regions of Europe and Asia, as well as of America; although in his 'Comparative List,' Bonaparte does not give it as an American species, but classes it with the *Cygnus Buccinator*.

It breeds within the Arctic Circle, and in Iceland in May, according to Temminck, who says that it has been found on the maritime coasts of Picardy. It is an occasional visitor to the British Islands, especially in severe winters.

The call-note of this species is said to be a low-toned whistle, according to Mr. Sinclaire, but this was in confinement. Mr. Blackwall describes their calls in their wild flights as loud, and says that a flock of twenty-nine of them were very clamorous.

3. *Cygnus immutabilis*, Yarrell, the Polish Swan. This species is a native of the high northern regions and the Baltic, and occasionally visits our island. It is easily reconciled to captivity, breeding as freely as the common Tame Swan. The cygnets are white.

The following is Mr. Yarrell's description of the Polish Swan:—

'In the adult bird the beak is reddish-orange; the nail, lateral margins, nostrils, and base of the upper mandible black; the tubercle, even in an old male, of small size; the irides brown; the head, neck, and the whole of the plumage pure white; legs, toes, and intervening membranes slate-gray. From the point of the beak to the end of the tail, fifty-seven inches. From the carpal joint to the end of the second quill-feather, which is the longest in the wing, twenty-one inches and a half; tarsus four inches; middle toe and nail five inches and three-quarters. Its food and habits closely resemble those of the Mute Swan. The organ of voice appears, from one that I examined, to be like that of the Mute Swan; but Mr. Pelerin has found considerable differences in various parts of the head; the description and measurements were given in a paper published in the "Magazine of Natural History" for 1839.'

4. *Cygnus olor*, the Mute Swan, well known in its semi-domesticated state on our rivers and sheets of water. It is not however indigenous in our island. This species is the *Cygne* of the French; *Cigno* and *Cigno Reale* of the Indians; *Schwan* and *Höcker Schwan* of the Germans; and *Tame Swan* or *Mute Swan* of the British.

This elegant bird is said to exist in a wild state in Russia and Siberia. The Prince of Canino, in his 'Specchio Comparativo,' speaks of it as occurring in the neighbourhood of Rome; and in his 'Birds of Europe and North America' he gives north-eastern Europe as the locality. Temminck says, 'It frequents the great interior lakes, especially of Eastern Europe.'

Trachea simple, that is, non-convoluted.

In the Thames, at present, the greatest number of swans belong to the Queen, and the companies of vintners and dyers own the next largest proportion; but the birds are far less numerous than they used to be. The swan-marks are made upon the upper mandible with a knife or other sharp instrument. The swan-hopping or upping, that is, the catching and taking up the swans to mark the cygnets, and renew that on the old birds if obliterated, in the presence of the royal swan-herd's man, is still continued by the companies above mentioned.

North American Swans.

Dr. Richardson ('Fauna Boreali-Americana') records only two American swans, *Cygni Buccinator* and *Bewickii*. The Prince of Canino, in

his 'Specchio Comparativo,' gave one, *Anas Cygnus* (meaning, apparently, the Hooper). Nuttall notices three: 1st, the Wild or Whistling Swan, *Cygnus ferus* of Ray; 2nd, the Trumpeter Swan, *Cygnus Buccinator;* and 3rd, *Cygnus Bewickii.* The Prince, in his 'Birds of Europe and America,' records two species, *Cygnus Americanus,* Sharpl. (*Cygnus musicus,* Bonap.), and *Cygnus Buccinator;* but he does not record *Cygnus Bewickii* as an American species. Nuttall declares that in the winter of 1810 he saw two individuals of *Cygnus ferus* (*C. musicus,* Bechst. and Bonap.) in a state of domestication near St. Louis (Missouri), which were obtained, with several others at the same time, in consequence of the extreme cold. The Prince of Canino evidently considers his *C. musicus,* which he gives as a synonym of *C. Americanus,* as a different species from *Cygnus Bewickii,* which last stands opposite to *C. Americanus* in the European column.

South American Swans.

Various portions of the coast of South America (Chili, the Falkland Islands, Rio de la Plata, &c.) present us with a very beautiful species of swan (*Cygnus nigricollis*), distinguished by a jet black head and neck, contrasting admirably with the snowy whiteness of the rest of the plumage. The bill is red, the legs and feet flesh colour; size that of the Hooper. It has never we believe been brought alive to Europe.

Australian Swans.

Cygnus atratus (Genus *Chenopis,* Wagl.), the Black Swan. This, the *Anas Plutonia* of Shaw, has now become common in our menageries, where it breeds freely.

Mr. Yarrell observes that the structure of the trachea is intermediate between that of the hooper and the common mute swan. It 'quits the neck at the bottom, and descends to the centre circular portion of the furcula, to which bone it is firmly bound by a tough membrane: the remaining portion then rises over the front of the breast-bone, between the clavicles, and passes backward to the lungs, the last portion of the tube immediately preceding the bone of divarication being flattened horizontally. The form of the trachea in our common swan, in which it follows the neck without deviation, being remembered, and Dr. Latham's figure of the wild swan referred to, it will be observed that the Black Swan exhibits an interesting link between the two.' ('Linn. Trans.,' vol. xv.)

Geographical Distribution. — Van Diemen's Land, New South Wales, and Western Australia.

Habits.—In a state of nature the black swans are generally seen floating on some lake in flocks of eight or nine. When disturbed, they generally fly off in line or single file; and are so shy that it is difficult to get within gunshot. Their note is far from harsh, at least when uttered in captivity.

SWANSEA, in Welsh *Aber-Tawe,* a municipal borough, parliamentary borough, and seaport, in Glamorganshire, 204 miles W. from London by the old mail-coach road through Bristol to Milford, and 75 miles W. from Chepstow by the South Wales Railway, is situated on the W. bank of the Tawe at the junction of that river with Swansea Bay, in the Bristol Channel. The peninsula of Gower and the headland of the Mumbles, shelter the bay from S.W. gales, and render it an advantageous roadstead for vessels of large burthen. The harbour is formed by two piers, which extend from the land on each side, an opening in the centre being left for the entrance, and for the river to flow out. The harbour is nearly dry at low water. At high tide, the depth of water in the harbour is from 16 to 25 feet, and the tide flows more than a mile above the town.

The town is built along the right bank of the river, commencing about a quarter of a mile from the shore, and the main streets run in lines parallel to the river, other streets crossing them at right angles. The ground rises inland from the river and the sea, at first slowly, afterwards rapidly. The houses lie thickly along and near the river, and are generally old and bad. The central and S.W. parts contain several new and good streets and open spaces. N. and N.E. of the town, but chiefly on the E. bank of the river, are groups of furnaces and other works connected with the smelting of copper, for which Swansea is celebrated. The ore is imported from Cornwall, Devonshire, and other parts of Great Britain, and also from various foreign places, besides Australia. Besides the works for smelting copper, there are iron-works, zinc-works, tin-plate-works, yards for building and repairing ships, roperies, tanneries, and potteries. The traffic with the country is facilitated by several canals and tram-roads. A canal about 17 miles in length runs along the valley of the Tawe into Brecknockshire; another connects the Neath river and canal with Swansea harbour; and a third communicates with collieries on the N.E. of the town. The principal public buildings are—the town-hall, gaol, infirmary, union workhouse, theatre, assembly-rooms, two or three churches, and several places of worship for dissenters. There are also some remains of an ancient castle. In 1849 the trade of Swansea was as follows:—Foreign vessels—entered inwards with cargoes, 205, bringing 48,000 tons; outwards, with cargoes, 438, taking 50,000 tons; inwards, with ballast, 112; 9000 tons; outwards, with ballast, 16; 3600 tons. Coasting vessels—entered inwards with cargoes, 4000, bringing 263,000 tons; outwards, with cargoes, 6000, taking 355,000 tons. In addition to the above, about 100 vessels arrived in ballast, and about 200 cleared out in ballast. Eighteen out of the 205 (of a burthen of 600 tons each) entering inwards from foreign parts brought copper ore and wool from South Australia.

The municipal borough is divided into 3 wards, and is governed by 6 aldermen (of whom one is mayor) and 18 councillors; it includes an area of 5400 acres on both sides of the river, the area of Swansea proper being about 230 acres. The population in 1841 was 16,787, including the scattered houses and hamlets included within the area of the borough. The parliamentary borough returns one member, and includes, besides Swansea, the contributory boroughs of Aberavon, Kenfig, Loughor, and Neath.

SWARTZ, OLOF, a celebrated Swedish botanist, was born in the year 1760, at Norrköping in East Gothland, where his father was a considerable manufacturer. He commenced his studies at Upsal, in 1778, in the year that Linnæus died. Having acquired a taste for botany, he made several excursions in the years 1779–80–81 and 82, through various districts of Sweden, for the purpose of studying their botany, and visited Lapponia, Finland, and Gothland. In 1781 he took his degree as doctor of medicine, having presented a thesis entitled 'Methodus Muscorum Illustrata.' In this work he gave a new arrangement of the mosses, and laid the foundation for a larger work, entitled 'Dispositio Systematica Muscorum Frondosorum Sueciæ,' which was published at Erlangen in 1799. This work was illustrated with plates and descriptions of many new mosses. In 1783 he made a voyage to the western coast of America, and visited Jamaica and other islands in the West Indies; and, loaded with botanical treasures, he visited England on his return home, in 1788. He remained in this country a year, during which time he was occupied in examining the herbaria of Sir Joseph Banks, Sloane, and other botanists. He returned to his own country in 1789, and was elected a member of the Royal Academy of Sciences of Stockholm in 1790, and was appointed professor of natural history in the Medico-Chirurgical Institution at Stockholm. He was also honoured by being made a knight of the order of Vasa and of the Polar Star. His botanical works are very numerous. He also contributed several papers on zoology to various journals and Transactions. He died in the year 1818.

SWA'RTZIA, the name of a genus of plants, given by Willdenow in honour of Olof Swartz, a Swedish botanist. This genus belongs to the great natural order *Leguminosæ* or *Fabaceæ* of Jussieu. *S. tomentosa*, Tomentose Swartzia, forms a high thick tree, with strong angular branches, and grows on the borders of rivers in Guyana. It has a fine reddish-coloured wood, which becomes black by age, and is considered very indestructible, and is used for the making of rudders for ships. The bark of this tree is very bitter, and is used as a medicine in its native country. There are about 16 other species of Swartzia.

SWEARING, a profane use of the name of the Deity. By the 109th Canon, churchwardens are to present those who offend their brethren by swearing, and notorious offenders are not to be admitted to communion until they are reformed. Profane cursing and swearing were made an offence punishable by 20 Jas. I., c. 21 (continued by 3 Chas. I., c. 4; 16 Chas. I., c. 4; and 6 and 7 Wm. III., c. 11). The 19 Geo. II., c. 21, imposes penalties for swearing. By 22 Geo. II., c. 33, persons belonging to the navy who are guilty of profane oaths or curses are liable to punishment by court-martial.

SWEATING-SICKNESS. *Ephemera Sudatoria, Ephemera Maligna, Sudor Anglicus, Hydronosus*, are the various names which have been given to a severe epidemic disease, attended with great perspiration, which prevailed in this country and in some parts of the Continent at different periods during the latter part of the 15th and the beginning of the 16th centuries.

The sweating-sickness is said to have made its first appearance in this country in the army of the earl of Richmond, on his landing at Milford Haven in the year 1485. On the 21st of September of the same year it reached London, where it raged till the latter end of October. It re-appeared in this country during the summers of 1506, 1517, 1528, and 1551. From 1525 to 1530 it visited Holland, Germany, Denmark, Sweden, Poland, and parts of Russia; and it broke out in Amsterdam September 27, 1529, where "it raged but four days, sparing only old people and children, and attacking above one hundred persons a day. With respect to the mortality of this disease accounts are somewhat vague. Bacon informs us that in the first epidemic the patients recovered if they were attended to in time, but that many died before a remedy was discovered. The epidemic of 1517 appears to have been particularly fatal, frequently destroying its victims in two or three hours, and in some places carrying off one-third, and even one-half of the inhabitants: that of 1528 was also very fatal, but was remarkable for its short duration in each place. Hamburg lost 2000 of its inhabitants by this epidemic. The last outbreak of this disease in England happened at Shrewsbury in the year 1551, and was extremely fatal, sparing neither age nor sex: it raged from April to September, becoming milder in character towards its termination.

SWEDEN, a country in Europe, which is situated between 55° 20′ and 69° N. lat., 11° and 27° E. long. On the east of Sweden, from its southern extremity to 66° N. lat., extends the Baltic and the Gulf of Bothnia, which divide it from Russia. North of the Gulf of Bothnia it is separated from Russia by the Tornea-Elf, the Muonio, and the Köngämä, a feeder of the Muonio, which has its source in the small lake of Koltejaur, on the boundary of Norway. On the west Sweden is bounded by Norway, the Skagerrack, the Kattegat, and the Sound. South of Sweden is the western part of the Baltic, which separates it from Germany. The length of Sweden from S. to N. is about 950 miles; its width varies from 150 to 200 miles. The area is 169,831 square miles, and the population in 1840 was 3,138,884.

Coast.—Sweden has somewhat more than 1400 miles of coast, exclusive of the deep inlets. Along the most northern part of the Gulf of Bothnia the coast is low, and consists of sandy alluvial soil, brought down by the numerous rivers. The numerous islands along the coast are of the same character. The coast begins to rise as it approaches the Quarken [BOTHNIA, GULF]; and the islands which lie across that strait are rocky. South of the Quarken, as far as the town of Gefle, the coast presents an alternation of low and moderately-elevated shores. The islands are less numerous along the coast than farther north, but larger; many of them are low and sandy, others are undulating and rocky. The projection of the coast between Gefle on the north and Brä-

viken Bay near Norrköping on the south has a rocky shore of moderate elevation, indented by numerous inlets, which are generally small, with the exception of that which unites lake Mälar with the sea. The islands, which are innumerable along the coast, consist of rocks, only a few feet above the sea; and many of them are surrounded by sand-banks. South of Bräviken Bay to the island of Oland, the coast is partly rocky and somewhat elevated, and partly low and sandy. It is intersected by many inlets, all of which run E.S.E. and W.N.W., so as to give to this part of the coast nearly the appearance of a saw. The rocky islands are here so numerous as to render the access to the coast very difficult. The west coast of the Strait of Calmar, which divides the island of Oland from Sweden, runs in a less broken line, and is generally low. The islands in this strait are comparatively few; and south of Calmar they disappear almost entirely. The Strait of Calmar terminates on the south with Cape Tornhamnsudde or Torrumudde, a low rocky point E. of Carlscrona, whence the coast, which up to this point trended nearly due N. and S., suddenly turns to the W. This is the most broken rocky and elevated part of the coast of Sweden; it extends to a few miles W. of Carlshamn, and contains many good harbours, formed by the mouths of the rivers that fall in between the projecting masses of rock, and sheltered by the numerous islands which line the coast. The shores of the peninsula of Scania, the most southern part of Sweden, are low, sandy, and free from islands and rocks. Cape Kullen, at the northern entrance of the Sound, is of moderate elevation, but north of it the coast sinks down nearly to the level of the sea, and continues so to Warberg, up to which place no islands or rocks occur. The coast rises a little north of Warberg, and the rocky islands re-appear and increase in number northwards. It is very rocky, and intersected by several large inlets, which N. of Götheborg form the large islands of Hisingen, Työrn, and Orust. The other islands are small, consisting of rocky cliffs, and towards Norway of sand and alluvial matter.

Surface.—That part of Sweden which lies N. of 62° N. lat. rises continually from the Gulf of Bothnia to the boundary of Norway. Between 62° and 59° the country slopes southwards to the lakes of Wener, Hielmar, and Mälar, S. of which, the country rises again, and from 58° to 57° 10′ constitutes an elevated table-land bounded by slopes. This table-land is connected with the mountain-region N. of 62° by a low narrow ridge, which runs nearly due N. between 14° and 15° E. long., and 60° N. lat., and afterwards declines to the north-west.

The most elevated part of Sweden lies along the boundary-line of Norway, and is called the Kiölen Mountains, which range extends as far south as 64° N. lat. The mountainous country continues farther south to 61° N. lat., but this southern portion is a part of the Norrska Fiellen, or mountains of Norway.

1. The *Northern* part of the mountain-region of Sweden, which extends from the Muonio and Tornea to 64° N. lat., has a great uniformity of surface. The western districts, being occupied by the most elevated portion of the Kiölen range, contain very high mountains, and a considerable tract surrounding Mount Sulitelma is always covered with snow. The lowest parts of the highest portion of the range are about 4000 feet above the sea. From these parts the surface slopes first rapidly, then gradually, towards the Gulf of Bothnia. In the highest region, which has a breadth of about 40 miles, all the mountains rise above the level on which trees grow, and it is only in the valleys, most of which are filled with lakes or swamps, that some diminutive firs and pines are found. This region is inhabited only by a few families, who subsist on cattle and lake fish. Below this mountain-region extends the high tract, in which the country descends from about 2000 feet to 800 feet above the sea. The width of this tract is about 60 miles. Numerous offshoots from the Kiölen Mountains traverse its whole width, and their summits are generally above the line of vegetation. The valleys between them are several miles wide in many places, and nearly all of them are occupied by alpine lakes, some of which are above 60 miles in length. The largest of these lakes are those of Tornea, Stora, and Horn, which give rise to the rivers Tornea, Lulea, and Skelleftea. The greater part of the low ground in the valleys is always under water; the remainder is inundated in the beginning of June, when the snow on the lower mountains melts, and again at the end of July, when it melts on the higher part of the range; consequently no part of this tract is cultivable. These inundations are favourable to the growth of grass, and the inhabitants maintain themselves principally by feeding cattle and by fishing in the lakes. This tract contains some good forests, but their situation, and still more the rapidity of the rivers, which do not admit either of navigation or floatage, render them quite useless, except as fire-wood for the use of the inhabitants. Nearer the sea is the lower region, with a breadth of about 70 miles, its general level sinking from 800 to 300 feet. The offshoots above mentioned here sink into hills, hardly more than 500 feet high, and are generally wooded to their summits. There are small level tracts between them, which are dry; but owing to the severity of the climate and the poverty of the soil, only potatoes, cabbages, a little barley, and rye are grown. The fir and pine cover the greater part of the country, and pitch and tar are made from them. Between this lower tract and the Gulf of Bothnia extends the lowest region, the average width of which is about 30 miles; and its surface is level or gently undulating, except south of the Skelleftea-Elf, where the country is hilly nearly to the sea-shore. The fertility of the soil is never above mediocrity, with the exception of the plain between the Tornea and Lulea Elf, which produces fine grass. Rye, oats, barley, and potatoes are grown. The pasture-grounds and meadows are extensive. Tar is made from the pine-trees.

2. The *Central* portion of the mountain-region,

of that which lies between 64° and 62° N. lat., though it resembles the northern portion, is distinguished by some peculiar features. The highest part of this region, situated within the Kiölen Mountains, is much narrower, and only a few summits are always covered with snow, among which the most elevated is the Sylfiallen, or Sylfiellen, which is 5860 feet above the sea-level. The rivers which originate in this region run only in ravines, and the whole tract is entirely uninhabited, and only visited for the pasturage in summer by a few Laplanders. The country adjacent to this mountainous tract forms a table-land, called *Jemtland*, about 1000 feet above the sea, and extending about 80 miles in every direction. The Jemtland forms a sort of basin, being enclosed by higher lands. In the lowest part of this table-land is the *Storsiön Lake*, 40 miles long by 12 wide, and 978 feet above the sea-level. From the Kiölen range a branch advances into the table-land for a few miles, terminating in Mount Areskutan, which is 4716 feet above the sea-level: its declivities afford pasture to the reindeer in summer. Besides the Storsiön Lake there are ten or twelve others, each of them from 10 to 15 miles long, and more than a mile wide. In spite of the great elevation of the country, and the stony nature of the soil, agriculture is carried on to some extent, the crops raised being similar to those already named. Towards the end of August the crops are sometimes destroyed by frost. The pastures being extensive, cattle, sheep, and goats are numerous; there is also a due proportion of horses and hogs. South of the table-land of Jemtland are the high valleys of the Ljungan and the Ljusnan, which are of considerable width, and though interspersed with hills, contain level cultivated tracts. In all the central region the crops very frequently fail, and the inhabitants are obliged to mix the inner bark of the pine-tree with their bread.

From the high ground which forms the eastern border of the Jemtland, and which may be about 1200 feet above the sea-level, the country slopes regularly towards the sea, and at the distance of about 30 miles from it, sinks to 300 feet. There are no considerable hills on this slope, but the rivers that cross it run in deep narrow valleys, in which they frequently expand into lakes, and usually form rapids and cataracts. In this tract agriculture is very limited. The remainder of the region, reaching to the Gulf of Bothnia, is almost entirely occupied with isolated hills or short ranges, which have generally steep declivities, and frequently rise 1000 feet above the sea. Between them are valleys of small extent, the lowest part of which is occupied by a winding river, or by a small lake, fringed on either side by meadows or woods. The hills are generally clothed with trees. This tract contains a much larger portion of cultivated ground than any of those before described. Barley is very extensively cultivated. Potatoes, rye, oats, and peas, are grown to some extent. But the rearing of cattle is the principal occupation of the inhabitants. The number of black cattle and sheep is great, and that of goats considerable, but horses and hogs are few in number. A considerable quantity of timber is exported.

3. The *Southern* part of the mountain-region extends S. between 62° and a line joining the river Glommen in Norway at Kongsvinger, the most southern bay of lake Siljar, and the town of Södorhamn, on the Gulf of Bothnia. The mountainous part of this region, which is not extensive, constitutes a part of the Norrska Fiellen. From Mount Sylfiellen eastwards run three ridges enclosing the upper valleys of the rivers Ljungan and Ljusnan; towards the south run other ridges, which divide the branches of the Dal, the Öster, and Wäster Dal, from each other, and the Wüster Dal from the Klar-Elf, whilst the most western ridge separates the Klar-Elf from the Glommen Elf. These last-mentioned ridges are of considerable width, and lie close to one another, having between them narrow valleys, too elevated to be cultivated, and inhabited only by a few families who cut the wood in the pine-forests with which the lower parts of the mountains are clothed. The general level of this region is about 2000 feet above the sea; but in the neighbourhood of the lake Fämund in Norway, where it is highest, several summits attain the snow line, and exceed 5800 feet in height.

The elevated ridge which separates the valley of the Wäster Dal from that of the Klar-Elf, preserves a considerable elevation (1000 feet) S. of 61° N. lat., running S.S.E. until it has passed 60° N. lat., when it turns S., and forms the watershed between the Wener and Mülar lakes, and farther south separates the basins of lakes Wener and Wetter. In these parts it is called the Tifveden range; it attains a height of only 500 to 700 feet above the sea-level, and seldom exceeds 3 or 4 miles in width.

The country E. of this ridge and of the mountain-system of Mount Sylfiellen, resembles in its great features the countries which lie farther north, consisting of a higher, lower, and lowest tract. The higher tract, the general level of which is more than 800 feet above the sea, stretches from the mountains to the western extremity of lake Siljar, and N. of the lake it extends much farther to the east, leaving between it and the sea a space not quite 40 miles wide. The surface consists chiefly of long gentle swells, with level summits. The scanty crops raised, and the domestic animals reared, are of the same kinds as those before mentioned. Goats are more numerous here than in any other district of Sweden. Nearly the whole tract is covered with forests, the produce of which finds a ready sale in the adjacent Region of the Mines.

Lake Siljar is 25 miles long by 15 wide, and 555 feet above the sea. On the west and south it is surrounded by very low hills, alternating with level plains; and here agriculture is conducted on a larger scale than in the country E. and N. of it.

The eastern portion of this region, extending from the Gulf of Bothnia about 40 miles inland, is an inclined plain, which gradually rises from the sea to an elevation of 800 feet. The surface of this tract is interspersed with numerous hills of moderate elevation, and with lakes. A plain

of considerable width extends along the shores from 61° 40′ N. lat. to the mouth of the Dal-Elf (60° 40′): this is the most northern part of Sweden in which wheat is grown. Barley and potatoes are extensively cultivated; rye, oats, and peas are also grown. Sheep and cattle are very numerous.

4. South of the region just described is the *Region of the Mines*, which occupies the whole breadth of Sweden. Its southern boundary runs W. of lake Wener along 59° N. lat.; E. of that lake it runs from 59° N. lat. to the town of Orebro at the western extremity of lake Hielmar, and thence N.E. along the Dal-Elf. The Tifveden ridge crosses it nearly in the middle; and its elevation in these parts probably never falls below 1000 feet above the sea. This region slopes on the west of the range southwards, and terminates on the banks of lake Wener. The country lying east of the Tifveden ridge slopes southwards in the southern and eastwards in the northern districts. On the west side of the great southern bend of the Dal-Elf, and only a few miles from it, is a tract of considerable extent, which rises from 800 to 1000 feet above the sea. The surface is covered with a succession of low unconnected hills, the slopes of which are covered with wood. The low grounds between the hills are of small extent, and the lowest part is generally occupied by a lake or marsh. These small lakes and marshes are almost countless. In the country west of the Tifveden ridge the lakes are also numerous, several of them reaching a length of 20 miles, but seldom exceeding 2 miles in breadth. The soil of this region, consisting chiefly of gravel and sand with a mixture of clay, is carefully cultivated, as there is a ready market for the produce among the miners. The greatest number of the iron-mines of Sweden and the richest are situated within this region. In a few places there are good pastures; and cattle, sheep, horses, and hogs are numerous in the southern districts. A large portion of the surface is covered with trees, few of which produce timber, but they are valuable for the working of mines.

5. To the south-east of the Region of the Mines is the *Central Agricultural Region*, which comprehends the greatest extent of low country in Sweden. No part of this tract exceeds 300 feet above the sea-level. Its southern boundary is a higher tract, which is connected with the Tifveden ridge, N.W. of the northern extremity of lake Wetter, and extending from the ridge eastward, terminates in the Kolmoren Hills on the north shore of Bräviken Bay, an inlet of the Baltic. That portion of the region which is N. of lake Mälar is a plain, interspersed with a few low and isolated hills. The country S. of the lakes Mälar and Hielmar is more undulating; in some places it is broken and interspersed with rocks, and contains numerous lakes. The soil, a mixture of sand and clay, is of a greater degree of fertility than is usual in Sweden. Rye is the principal object of cultivation, and the produce is greater than that of all other grains taken together. Next to rye are barley and wheat; very little oats is grown, but potatoes and peas are largely cultivated. Cattle, sheep, horses, and hogs, are numerous.

6. South of the central agricultural region, and extending to about 58° N. lat., is the *Plain of Linköping*, which is one of the most fertile tracts in Sweden. From the shores of the Baltic to the banks of lake Wetter, it measures above 60 miles, with a width of from 15 to 30; and its whole area is about 1500 square miles. The surface is generally level, rising gradually towards the west, so that lake Roxen, which is nearly in the middle of the plain, is 106 feet above the sea-level, and on the banks of lake Wetter the country is about 300 feet high. The soil of the plain is a mixture of clay and sand, and in some places of loam, especially towards lake Wetter, where also its fertility is much greater than in the eastern districts. In no other part of Sweden is wheat so extensively cultivated as in this plain, but rye and barley are grown to a still larger amount. All kinds of domestic animals are numerous, with the exception of goats. Meadows and enclosed pasture-grounds occupy about half the surface of the plain; the remainder is nearly equally divided between cultivated and forest land. The great Göta Canal crosses the plain of Linköping.

7. To the south of the plain of Linköping rises the *Table-land of Småland*. This extensive region, with its declivities, occupies nearly the whole of the country S. of 58° N. lat., leaving only comparatively narrow tracts of lower ground along the sea, which bounds it on the east, south, and west. At the south-western extremity of this region is the extensive level of Scania. The eastern border of the table-land is a little W. of 16° E. long., and the southern border is a short distance south of 56° 30′ N. lat. The western border runs parallel to the shores of the Kattegat, at the distance of about 15 miles. The northern boundary on both sides of lake Wetter extends a few miles north of 58°. Along the outer borders the elevation of the table-land is between 300 and 400 feet, but in the centre it rises to more than 800 feet above the sea. The most elevated portion of the table-land extends about 36 miles S. from lake Wetter, and occupies about one-third of the whole region; it is traversed by a ridge of higher ground, a continuation of the Tifveden ridge, which as it approaches the southern extremity of the lake rises higher, and where it meets the table-land it has an elevation of more than 900 feet. Nearly 10 miles south of the lake rises on this ridge a high hill, called *Taberg*, which consists of pure ironstone, and is 1100 feet high above the surface. From this summit the ridge runs westward, and near the centre of the higher portion of the region it again rises to more than 1100 feet above the sea, and divides into two branches, of which one runs W. and the other S.W: both of them terminate on the margin of this region. The surface of the table-land varies greatly. There are many tracts of considerable extent, which are level plains: other districts have a broken surface. On the higher part of the table-land there are only a few lakes, but in its western and southern districts they are very numerous. As the table-land is not protected by a range of mountains against the winds, it suffers much from gales, and its climate is severe. The winter lasts seven months: the

cold is very intense for three months, and a great quantity of snow falls. The great mass of rocks on which the table-land rests is composed of gneiss, and as these rocks when disintegrated form the worst kind of soil, this region is of very moderate fertility. Tracts many miles in length and width are covered with sand, on which nothing grows but heath, and some spots are quite destitute of vegetation. Where the soil is mixed with a little vegetable mould, the country is covered with stunted birch woods. The best tracts are those surrounding the lakes. Wheat is grown in a few places, but the produce is very scanty. Rye yields about four times the seed. The principal grain raised on the higher part of the table-land is oats, and on the lower part barley. The cattle, sheep, and hogs are of small size, and the wool of the sheep is very coarse.

8. *The Maritime Region of Smäland* stretches along the coast opposite the island of Oland, for about 140 miles, with a breadth of 15 to 25 miles, and terminates within about six miles of the Göta Canal. The surface presents great varieties. The southern districts are undulating; and between the elevations there are extensive flats. The soil is bad. The greater part is covered with fir and birch woods, but there are few timber-trees. The northern districts have a much more broken surface, presenting a succession of steep hills, valleys, and small plains, with numerous lakes. The soil here is better; a comparatively large portion of the surface is under the plough. Most of the valleys and hill slopes produce abundance of grass. The forests constitute the great wealth of this tract: they contain pine, fir, birch, beech, and oak. Timber, tar, and pitch are exported. Rye, barley, a little oats and wheat, and large quantities of potatoes are grown. Domestic animals of every description, except goats, are abundant.

The island of *Oland*, which is separated from Sweden by the Strait of Calmar, lies parallel to the coast, and is 80 miles long, with a width varying from 2 to 8. The surface consists of a long uninterrupted chalk ridge nowhere exceeding 200 feet in height, and covered with a layer of earth, so that its fertility is superior to that of the opposite coast. The northern part is covered with woods. The greatest portion of the island is used as pasture-ground; ponies distinguished for their strength are exported in great numbers. Rye and barley are the chief products.

9. *The Maritime Region of Blekinge* extends over the southern coast of Sweden from about 14° 30′ to 16° E. long., 60 miles in length, with a breadth of about 15. This is the most broken portion of the Swedish coast. The rocky masses of the table-land of Smäland, divided into small ridges by numerous watercourses, which run in deep and narrow valleys, advance within a short distance from the shores, where they terminate in hills from 200 to 300 feet high. The small rivers, descending from an elevated tract, are extremely rapid, and form many small and beautiful cataracts. The level grounds are much less extensive in this region than in any other part of Sweden. Wheat, barley, and potatoes are grown, but rye is the principal crop. In some parts the hills are covered with stunted woods of birch and fir. The rearing of cattle and hogs constitutes the principal object of domestic economy, and much cheese is made.

10. *The Plain of Scania* occupies all the peninsula which constitutes the most southern portion of Sweden, S. of a line drawn from the mouth of the Ronne, in the Skelder Vik, on the W. to Sölvetsburg on the E. Its length from S. to N. is about 55 miles, the width varies from 50 to 60. It is not a level plain, but is traversed by a low broad swell, which begins at Cape Kullen, N. of the Oresund or Sound, and extends in a south-east direction, enclosing the Ringsiön lakes, and terminating about 12 miles from the sea, in low hills. The tract of country between the termination of this swell and the south-eastern shores of Scania is a level, with numerous depressions, which are occupied by marshes and swamps. The portion of the region which is situated S.W. of the swell contains a large level plain, extending along the shores of the Oresund, from the southern extremity of the peninsula to the vicinity of Helsingborg, varying in width from 6 to 10 miles: it is wider towards the south than toward the north. The soil of this tract is of first-rate quality, consisting of a strong rich loam, which yields good crops of wheat. This large tract is almost entirely under cultivation. The country between this plain and the swell above mentioned is not so level, and its soil is much inferior. The portion of the plain lying N.E. of the swell contains also a considerable level round the town of Christianstad, which has a fertile soil. The hilly tracts on both sides of the swell occupy more than three-fourths of the plain, and only a small portion of them is cultivable; the remainder is used as pasture-grounds for sheep, which are more numerous here than in any other part of Sweden, and the wool also is better. Horses, oxen, and pigs are numerous. Only a few goats are kept.

11. *The Maritime Region of Halland*, which extends about 100 miles, with a width of 15, along the eastern shore of the Kattegat from the Skelder Vik to the mouth of the Göta-Elf, is the western declivity of the table-land of Smäland. The level portion of this region is separated from the plain of Scania by a tract of high land about 8 miles wide and between 400 and 500 feet high, which projects from the south-western corner of the table-land of Smäland, and running W. terminates in the peninsula of Halland's As, between Skelder Vik and the Bay of Laholm. The most level part extends to the vicinity of Warberg. In these parts the table-land of Smäland descends with a continuous declivity, which is only broken by the watercourses, nearly to the sea-level, leaving between its base and the shores a tract of undulating ground about 8 miles wide. The soil is generally above mediocrity; it produces rye, oats, and potatoes. The slopes of the hills at the back of the undulating plain make good sheep-walks. The northern districts of this region, from Warberg to the mouth of the Göta-Elf, have a much more broken surface. Rocky hills of moderate elevation extend from the table-land nearly to the sea-shore, and between them are wide valleys, partly filled with long lakes. Large numbers of

sheep and cattle are kept, and also many horses. The small portion under cultivation produces chiefly rye and barley.

12. The *Southern Basin of Lake Wener* extends over the isthmus between the lakes Wener and Wetter; on the west it borders on the Göta-Elf. The basin of lake Wener is very limited on the east and west. On the east the Tifveden ridge, running parallel to its eastern banks, is only 8 or 9 miles distant. On the west the stony masses of the Rocky Region advance still nearer to the border of the lake. But towards the south the basin extends about 60 miles, and to the north 120 miles. The northern portion of the basin forms part of the region of mines, and the southern constitutes this region. From S.W. to N.E. this region measures more than 80 miles; the width varies from 70 miles at its southern boundary to 10 miles at 59° N. lat., its northern boundary. The greater part of this region is a plain, sloping gently northwards towards lake Wener; on the east and south it is surrounded by higher land. At its most northern boundary the Tifveden ridge enters the region, and between the lakes Skager and Unden it runs S.W. at about 550 feet above the sea-level, 416 feet above lake Wener, and 263 feet above lake Wetter. Soon afterwards it turns to the south, gradually rises higher, reaching an elevation of 800 feet, and joins the table-land of Smäland, the northern edge of which constitutes the southern boundary of the plain. On the plain there are a few isolated mountains of considerable height, consisting of sandstone, limestone, and alum slate. The highest and most extensive of these masses are the Billungen, nearly in the centre of the region, and the Kinne Kulle, on the shore of lake Wener, which rise respectively 1000 and 902 feet above the sea. The soil of the plain is composed of sand and clay, and possesses a considerable degree of fertility: some tracts where the sand predominates are covered with heaths. Rye, barley, and potatoes are extensively grown, but not much wheat or oats. The meadows and pasture-grounds are less valuable than in most of the other provinces of Sweden, except on the borders of the lakes.

13. The *Rocky Region* occupies the whole tract between the course of the Göta-Elf, the Skagerrack, and Norway as far as 59° N. lat. From S. to N. it is about 90 miles long; the width varies from 10 miles in the south to 55 miles at the northern boundary. It may be divided into three districts. 1. The rocky district lies along the shores of the Skagerrack, and extends 10 or 12 miles inland. Near the sea the surface of this tract is covered with high precipitous rocks; in other parts it is hilly. Farther north, especially near the boundary of Norway, the rocky masses rise 400 or 500 feet, and on them there occur other masses, which are from 100 to 200 feet higher. The rocks are in general only covered with lichens; and most of the narrow or flat valleys, in which a thin layer of earth occurs, are only peat-mosses, or overgrown with juniper bushes. 2. The middle tract may be called the wooded district. It begins in the parallel of the southern extremity of lake Wener. The surface is from 300 to 500 feet above the sea.

The hills and rocks with which it is covered have rounded tops, and the declivities are much less precipitous: they are generally covered with birch, fir, and pine, and make tolerable pasture-grounds. The depressions and valleys contain numerous cultivated tracts and along the lakes extensive meadows. 3. The eastern portion of the region is an agricultural district, which lies along lake Wener, and runs from its most southern extremity near Wenersborg to the north of 59°. But it is not of great extent, as it only reaches a distance of six or eight miles from the borders of the lake. This tract towards the south is low, and covered with a rich alluvium. Towards the north the low offsets of the hills which lie farther west advance nearly to the shores of the lake. In this district much rye, barley, peas, potatoes, and some wheat are grown. The agricultural produce of this tract finds a ready sale in the Region of the Mines.

North of the parallel of Gefle not more than 1-280th of the surface of Sweden is under cultivation, while to the south of it about 1-20th of the area produces food for man. This difference is less the effect of the climate than of the soil. Though in the southern portion there are several extensive tracts which consist of bare rocks, they are small in proportion to tracts of the same kind in the north. The *boulders* diminish the extent or value of the cultivable tract. There hardly occur ten square miles, with the exception perhaps of the plain of Scania, in which there are not *erratic rocks* in great numbers, and in some places they cover nearly half the surface. These rocks, as well as those *in situ*, are of gneiss, and the soil derived from their disintegration is barren. The rocks in Sweden everywhere, except in the highest mountains, present an abraded surface with here and there scratches, tending generally to the south-west. These phenomena, as well as the erratic blocks, are supposed to be the results of some long-distant glacial agency.

The lowering of the sea along the coast of Sweden is a fact that has been established by continued observations for a whole century. This decrease of the water is greatest towards the northern extremity of the Gulf of Bothnia, where the difference observed within a century has been found to amount to four feet. In proceeding southward it diminishes gradually, and its effect seems to disappear along the south coast, but it has been noticed in the Kattegat N. of Cape Kullen, and even at the mouth of the Göta-Elf, where it is about as much as on the eastern coast under the same parallel. The difficulty of explaining this phenomenon satisfactorily has suggested the notion that the whole Scandinavian peninsula is raised gradually higher by some internal force.

Lakes; Rivers; Canals.—The lakes in Sweden, large and small, are very numerous, and have been estimated to cover nearly one-eighth of the area of the kingdom. The largest lake is the *Wener*, which is traversed by 59° N. lat., and has an area of 2000 square miles: the surface is 144 feet above the sea-level. Two headlands projecting from the northern and southern shores divide it into two unequal parts, of which the western, called lake Dalbo, has a length of 55

miles and a breadth of 20. The passage by which it is connected with lake Wener is about 15 miles wide, but numerous small rocky islands lie across the strait, leaving only narrow passages, a circumstance which renders the navigation dangerous, on account of the gales, which are not unusual on the lakes. Lake Wener, to the east of the strait, is 60 miles long and 30 wide. The shores of both lakes are lined with rocky islands. Lake Wener receives numerous rivers, especially from the north. Its largest feeder is the *Klar-Elf*, which issues from the south-western extremity of lake Fämund in Norway, where it is called Tryssild-Elf. After a rapid southern course of more than 70 miles, it enters Sweden a little north of 61° N. lat., and takes the name of Klar-Elf. In Sweden it runs southwards for more than 120 miles. About 60° N. lat. its course is broken by rapids and cataracts. Below this point the river runs with less rapidity, but it cannot easily be navigated except in the last 20 miles of its course. Wood is floated down from the upper country. Near its mouth it divides into two arms, which enclose the island of Tingwalla, on which the town of Carlstad is built. The waters of lake Wener are carried to the Kattegat by the *Göta-Elf*, which runs S. by W. more than 50 miles, and about 14 miles from its mouth divides into two arms, which enclose the island of Hisingen. In its natural state the river was rendered unfit for navigation by several cataracts, which occur in the first 18 miles of its course, within which distance the river descends about 130 feet. The principal obstructions to the navigation are the cataract of *Rånum*, about 2 miles from the place where the river leaves the lake; the rapids of *Trolhättan*, which occupy about 5 miles, within which space the river descends 108 feet; and the cataract of Lilla Edet, which is 10 feet high, and about 18 miles from the efflux of the river. But by means of canals and locks the Göta-Elf has been rendered navigable for vessels of light draught. The West Göta Canal, which traverses lake Vicken, and has 24 locks, connects lake Wener with *lake Wetter*, which occupies the centre of southern Sweden, and is about 80 miles long and 10 broad. Its surface is 288 feet above the sea, while at the distance of a few miles east and west the level country is several feet lower. It partakes of the nature of an alpine lake, being in one place more than 70 fathoms deep. Its feeders are for the most part torrents; and it is subject to heavy gales. The *river Motala* issues from this lake on the north-east, and after having traversed the plain of Linköping, carries its waters through the lakes of Boren and Roxen, into the Bay of Bräviken. The whole length of the river, exclusive of the lakes, is only 25 miles; its descent is too rapid for navigation. The Eastern Göta Canal, which unites lake Wetter to the Baltic, is about 64 miles long, inclusive of the lakes which it traverses: it extends along the bank of the Motala eastward to its efflux from lake Roxen, whence it continues in a straight line, and enters the Baltic by the inlet of Säte Baken, two miles below Söderköping. This canal has 35 locks. The line of navigation thus traced from the town of Göteborg on the Skagerrack to Söderköping on the Baltic, was completed by Telford; it gives Sweden an inland navigation of 260 miles, and very considerably shortens the route from the Kattegat to Stockholm, while it avoids the Sound dues. Steamers ply regularly between Stockholm and Göteborg. The navigation is closed generally from Christmas to the beginning of May. Lake *Hielmar*, which extends about 35 miles from E. to W., and is from 2 to 8 miles wide, lies N.N.E. of lake Wetter. It communicates by a canal and locks with the Mälar lake.

Lake Mälar differs greatly from all the other lakes of Sweden. It consists of many small lakes, united by short channels, which enclose islands. From what may be called the main body of the lake several narrow but navigable arms branch off to the south and north, and penetrate to a great distance inland. Its length exceeds 60 miles. It is nearly on a level with the Baltic. The advantages of the navigation on lake Mälar have been increased by the Södertelge Canal, a cut about 2 miles long, which unites one of its arms with a deep inlet of the Baltic, called the Järne Fiord. Steamers and other vessels that ply on the Göta Canal reach Stockholm by this route. The Strömsholms Canal, leading to lake Barken, in the region of the mines, joins the Mälar lake not far from its western extremity. There are many Runic stones and other antiquities in the neighbourhood of the Mälar lake.

Sweden has few naturally navigable rivers. The rivers S. of 60° have generally a short course, but N. of 60° there are several which run above 300 miles, descending from the Kiölen range to the Gulf of Bothnia. Nearly all of these run from the north-west to south-east. The largest is the *Dal-Elf*, formed by the junction of the Öster-Dal, which traverses lake Siljar, and the Wäster Dal, or Fulu; the general course of the branches, and of the united stream, is nearly S.E. to near Avesta, where the Dal-Elf turns E. by N., and forming several lakes enters the sea a little S. of Gefle. About 6 miles from its mouth it forms the magnificent cataract of Elfcarleby. Farther N. is the Ljusnan or Ljusne Elf, whose most remote branches originate on the southern declivity of Mount Sylfiellen. It runs with very rapid course, forming several cataracts, and falls into the Gulf of Bothnia S. of Söderhamn, after having run about 250 miles. Farther N. the Gulf of Bothnia receives the Ljungan-Elf, the Indals-Elf, and the Angerman-Elf, which are briefly noticed in a subsequent part of this article. The rivers of Bothnia are noticed under BOTHNIA.

Climate.—The difference in the climate of various places in Sweden is chiefly to be attributed to the difference of latitude and elevation above the sea-level. The most northern point of the country lies 2½ degrees N. of the polar circle: the most southern is situated nearly 11 degrees S. of it. A small portion of the surface is so elevated that it is always covered with snow; and large tracts along the sea-coast are only a few feet above the sea. The elevation at which perpetual snow occurs is less as we proceed farther north.

Near 60° N. lat. it is about 5600 feet, at 61° N. lat. 5400 feet, at 62° N. lat. 5100 feet, at 64°, 4650 feet, and at 71° N. lat. 2300 feet above the sea.

The mean annual temperatures of the following five places S. of 60° N. lat. are as follows:—

Place.	Lat.	Height in feet.	Mean annual temperature.
Lund . .	57° 42′	60	45.10° Fahr.
Wexiö . .	56 53	500	44.56
Göteborg .	57 42	0	46.34
Carlstad . .	59 23	175	43.28
Stockholm .	59 20	125	42.18

The mean annual temperature of Edinburgh is close upon 47° Fahr.; but the summer at these five places is several degrees warmer than at Edinburgh. The difference however between the greatest summer's heat and winter's cold is far greater than is experienced in Great Britain. In Stockholm for instance the thermometer has marked 96.8° in July, while in January of the same year the mercury had sunk to 26.6° below zero.

Of five places N. of 60° the mean annual temperatures are as follows:—

Place.	Lat.	Height in feet.	Mean annual temperature.
Falun . .	60° 39′	400	39.92° Fahr.
Hernösand .	62 38	0	38.36
Ostersund . .	63 24	1050	35.80
Umea . .	63 50	0	35.42
Enontekis .	68 30	1440	27.04

The difference in the mean temperature of summer in these five places lies within 4°, though the most southern and the most northern are nearly 8° of latitude distant from one another, and the most northern is more than 1000 feet above the sea-level. This fact is to be attributed to the long stay of the sun above the horizon in that season, which, at Enontekis, lasts more than three weeks. But on the other hand the cold of winter in these parts is often so great that mercury freezes—a fact which indicates at least 40° below zero.

Sweden cannot be said to have more than two seasons—winter and summer—which succeed each other with an interval of only a few days. Summer begins about the end of April and continues till August or September. The winter lasts during all the other months of the year; the ground is then deeply covered with snow; and the rivers, canals, and lakes, are frozen generally from October till some time in April, or sometimes till May. After the snows have fallen and the winter has fairly set in, the climate, though so cold, is said to be very healthy, owing to the great elasticity and dryness of the air. The number of rainy days in the year is said to be 149 in the southern districts. The short duration of the summer, especially N. of 60° N. lat., accounts for the prevalence of rye and barley crops, which require but a short time to come to maturity, and are frequently reaped within seven weeks from the sowing of the seed.

Products.—The climate and soil are less favourable to the growth of grain in Sweden than in most other parts of Europe. The principal objects of cultivation are rye, barley, oats, peas, and wheat. The produce of potatoes has increased from about 200,000 qrs. in 1805 to about 2,000,000 qrs. in 1840. Other objects of cultivation are hemp, flax, and tobacco; buckwheat, carraway-seed, hops, and madder. Cherries, apples, and pears, are abundant only in the southern districts; cranberries and other berries abound in the northern districts. The forests are very large, covering altogether more than one-fourth of the whole of the surface of Sweden. The export of timber, though considerable, is not in proportion to the immense extent of the woods. The forests supply firewood, of which a great quantity is consumed, as Sweden has no useful coal. Large quantities of charcoal are also used in the mines and factories. Tar and pitch are extracted chiefly from the roots of *pine-trees*, and are minor articles of export. Several kinds of coniferous trees and birch compose the greater part of these forests. Oak and beech grow only in the southern districts. As the pasture-grounds are in general very indifferent, the animals are small, especially the horses. Cattle and coarse-woolled sheep are the most numerous. In the northern districts reindeer are kept by the Laplanders. [LAPLAND.] Wild animals are numerous, especially in the northern parts, but some of them begin to be scarce, as bears and beavers. Wolves, lynxes, *gluttons*, foxes, hares, squirrels, martens, and others are common. Lemmings sometimes come down in large numbers from the Kiölen Mountains, and lay waste the low country. Elk and deer are found in the large forests. The largest of the wild birds are eagles, capercailzies, and woodcocks. The seas of Sweden contain abundance of fish. Salmon abounds in almost all the rivers and lakes.

Sweden is rich in minerals. Gold is found on the table-land of Smäland, at Adelforss, but no mines are worked. Silver-mines are worked at Sala, in Westeras Län, and at some other places, and in Falu Län. The annual produce of the copper-mines amounts to nearly 1000 tons. The richest mines are those at Falun in Falu Län and at Otvidaberg in Linköping Län. Lead-mines are worked in Westeras and in Falu. Iron-ore is found in nearly every district of Sweden, and there is no part where it is not worked more or less, with the exception of the plain of Scania, where it seems that no iron-ore exists. The best iron is obtained from the mines of Dannemora in Upsala Län. The annual produce of all the iron-mines of Sweden amounts to more than 67,000 tons of bar-iron. In Orebro Län are rich mines of cobalt, which yield annually more than 600 tons; this metal is found in several other parts of Sweden. At some places alum and vitriol are obtained, but only in small quantities. Some bad brown coal is raised near Cape Kullen in Scania. Porphyry is got at Elfvedal, in the upper valley of the Dal-Elf, and marble in the Kolmoren ridge, N. of Norrköping.

Population.—The bulk of the population are Swedes, a nation of Teutonic origin. Besides the Swedes, there is a small number of Fins and Laplanders. [FINS; LAPLAND.]

Divisions and Towns.—Sweden is divided into three great sections—Götaland or Göta Rike, Sweden Proper or Swea Rike, and Norrland. Each of these great sections was in course of time divided into several provinces, and these have been formed into districts called *läns.**

I. *Götaland*, or *Göta Rike*, comprehends nearly the whole country S. of 59° N. lat., and also that portion of the region of the mines whose drainage runs southward into lake Wener. It was formerly divided into ten provinces, and now contains 13 läns. The island of Gothland constitutes part of it.

1. *Skane, Scania*, or *Schonen*, extends over the plain of Scania, and the high ground which lies N. of it, comprehending also a small portion of the table-land of Småland. It is the most fertile and most populous part of Sweden, rich in agricultural produce and all kinds of domestic animals. It is divided into two läns.—*a. Malmö Län* (population, 221,670) extends over the south-western portion. The chief towns are, MALMÖ, with a population of 9800: *Lund*, about 7 miles from the Sound, in 55° 40′ N. lat., 13° 10′ E. long., is a well-built episcopal town, with a university, a library of 40,000 volumes, a botanic garden, and about 5000 inhabitants: *Ystad*, a small seaport on the south coast, with 4400 inhabitants, which has steam communication with Stralsund in Pomerania, and is a place of some trade: *Landscrona* is a fortress on the shore of the Oresund, with a good harbour and a population of 4000: *Helsingborg*, which is situated at the narrowest part of the Oresund, opposite Helsingör in Denmark, and has a harbour and 2854 inhabitants. The small island of *Hween*, in the Oresund, on which are some ruins of the observatory of Tycho Brahe, belongs to this län.—*b. Christianstads Län* (population, 165,880) contains the eastern and northern and less fertile part of the plain of Scania, and a small portion of the table-land of Småland. The capital is CHRISTIANSTAD, with 4800 inhabitants.

2. *Blekinge* contains the whole maritime region of Blekinge, with a narrow strip of the table-land of Småland: it is generally fertile, and has good fisheries along the coast and in the rivers. It forms one län.—*c. Carlscrona Län* (population, 95,807) which has for its capital *Carlscrona*. This town is built on an island in 56° 11′ N. lat., 15° 32′ E. long., and has 12,850 inhabitants. Carlscrona is strongly fortified, and has a spacious harbour; it is the principal station of the Swedish fleet. The docks cut out of the solid rock, the shipbuilding yards, the arsenal, and all the dock-yard buildings and workshops, are well worth seeing. The town has a naval college, and manufactures of cotton, tobacco, &c. The most commercial town is *Carlshamn*, on the coast W. of Carlscrona, with 4196 inhabitants, and a small but good harbour.

* In the following enumeration the Roman numerals mark the great sections, the Arabic numerals the former provinces, and the Italic letters the districts formed out of the provinces.

3. *Småland* comprehends nearly the whole of the table-land which bears its name, and the maritime region of Småland. It is divided into three läns.—*d. Calmar Län* (population, 184,557) comprehends all the maritime region and a small portion of the table-land. It is rather fertile, and has good forests, mines of iron, cobalt, and alum. CALMAR, the capital, has 5920 inhabitants. *Westervik*, farther north, has a good harbour, and above 3000 inhabitants. The island of Oland is included in this län.—*e. Wexiö Län* (population, 121,454) extends over the southern and lower portion of the table-land of Småland. It is a poor, thinly-peopled country. There are some unproductive iron-mines. The capital, *Wexiö*, has 1844 inhabitants.—*f. Jönköping Län* (population, 150,477) extends over the northern and more elevated portion of the table-land: the soil is bad, but the iron-mines are productive, especially those of the Taberg Mountain. The capital, *Jönköping*, is built at the southern extremity of lake Wetter, and has an artificial harbour, an arsenal, arms factory, 4215 inhabitants, and a considerable commerce with the countries that surround the lake.

4. *Halland* comprehends the maritime region of that name, and the western declivity of the table-land of Småland. It forms one län.—*g. Halmstads Län* (population, 94,934) has good forests and salmon-fisheries. The capital, *Halmstad*, has 1853 inhabitants, and exports timber, pitch, tar, and the produce of the mines of Jönköping Län.

5. *Western Götaland* comprehends the north-western portion of the table-land of Småland, and its declivity in that direction to the banks of the Göta-Elf, and also the plain S. of lake Wener. The whole of Mariestad Län, the largest part of Wenersborg Län, and a small part of Göteborg Län, are in this province.—*h. Mariestad Län* (population, 181,048), comprehending the greater part of the plain S. of lake Wener, is fertile and populous. It has some iron-mines and alum-works at Mount Kinne Kulle. The capital, *Mariestad*, on the shore of lake Wener, has 1573 inhabitants.—*i. Wenersborg Län* (population, 218,618) extends over the western and smaller part of the plain S. of lake Wener, the north-western part of the table-land of Småland, and the eastern part of the valley of the Göta-Elf. It contains the province of *Dalsland*. The capital, *Wenersborg* (population, 2500), is built near the efflux of the Göta-Elf from lake Wener, and carries on a considerable commerce in iron.

6. *Bohusland* extends over the western and more sterile portion of the rocky region. The inhabitants of the coast obtain their livelihood by fishing and gathering lichens. In the eastern parts are fertile spots and good pasture-grounds. It forms the greatest part of Göteborgs Län.—*k. Göteborgs Län* (population, 164,974) comprehends Bohusland and a small portion of Western Götaland. The last-mentioned district is rather fertile. The capital is *Göteborg* [GOTHEBORG]. *Udevalla*, built at the head of a deep inlet from the North Sea, and 14 miles W. of Wenersborg, has a good harbour, and exports timber. It has

a manufacture of cables, a sugar-house, and 3917 inhabitants. *Strömstad*, near the boundary of Norway, has a harbour, and 1500 inhabitants, who are mostly occupied in the lobster and oyster fisheries along the coast.

7. *Dalsland* is the smallest province of Sweden; it comprises the eastern and more fertile part of the Rocky region, and forms the northern part of Wenersborg Län.

8. *Vermland* comprehends that part of the region of mines which includes the northern part of the basin of lake Wener, and extends northward to 61° N. lat. It is richer in iron-mines than any other province of Sweden. From Göteborg this iron is exported to all parts of the world. Vermland forms one län.—*l. Carlstads Län* (population, 195,546) has for its capital *Carlstad*, which is built on the island of Tingvalla, at the mouth of the Klar-Elf. It is the centre of a considerable commerce with all the mining districts of Vermland: the population is 3034.

9. *Eastern Götaland* lies between lake Wetter and the Baltic, and contains the whole of the plain of Linköping, together with the higher grounds S. and N. of it. There are iron and copper-mines. It forms one län.—*m. Linköpings Län* (population, 206,625): *Linköping*, the capital, is situated in the centre of the province, about 2 miles S. of lake Roxen and the Göta Canal: it is a pretty, well-built place, with a cathedral, a grammar-school, manufactures of wool, stockings, and tobacco, and a population of 3800. *Söderköping*, situated about 2 miles above the entrance of the Göta Canal into the Slite-baken, is a small place, with about 1000 inhabitants. The largest place is NORRKÖPING. *Wadstena*, built on the shore of lake Wetter, contains 2188 inhabitants: lace, carpets, and woollen cloth are made here.

10. The island Gothland forms—*n. Wisby Län* (population, 41,575) [GOTHLAND].

II. *Sweden Proper*, or *Swea Rike*, comprehends the central provinces of the kingdom, which lie chiefly between 59° and 61° N. lat. It extends over the country surrounding the Mälar and Hielmar lakes, and over the basin of the Dal-Elf. It was formerly divided into five provinces, and contains six läns.

11. *Nerike*, the most south-western part of Swea Rike, is composed of portions of the region of mines, and of the central agricultural region. The mines occupy the northern, and the agricultural district the southern part of the province. Besides very extensive and numerous iron-mines, it has mines of copper, cobalt, alum, brimstone, and vitriol. It forms—*o. Orebro Län* (population, 125,061). *Orebro*, the capital, is built near the western extremity of lake Hielmar, and is one of the most commercial places in the interior of Sweden: the mining districts N. of the town bring their produce here and take in return corn, manufactured articles, and foreign goods. The population is about 5000. Woollen stuffs and arms are manufactured at Orebro.

12. *Södermanland*, or *Sudermania*, comprehends the country between the Kolmoren ridge on the S., and the lakes Hielmar and Mälar on the N.; and contains the best part of the central agricultural region. It has iron-mines and marble-quarries. The western part of this province forms Nyköpings Län, and the eastern, which is much smaller, constitutes a part of Stockholms Län.—*p. Nyköpings Län* (population, 114,920) has for its capital *Nyköping*, which is built at the head of an inlet from the Baltic, forming a harbour that admits only small vessels. It has manufactures of woollen cloth, linen, silk, tobacco, stockings, pins, paper, and brass. Cannons are cast. The population is 3000. *Eskilstuna*, which is situated between lakes Hielmar and Mälar, is a thriving town with 2500 inhabitants, important iron manufactures, and a copper foundry. Arms and cutlery are also made.

13. *Upland* extends from the northern banks of lake Mälar to the banks of the Dal-Elf along the Baltic, and about 60 miles inland. It comprehends the largest portion of the central agricultural region, and has considerable iron-mines, among which those of Danemora yield iron of the finest quality. Upland is divided into two läns.—*q. Stockholms Län* (population, 110,279), comprehends the eastern half of Upland, and also part of Södermanland. The chief town is STOCKHOLM, the capital of the kingdom. *Oregrund*, a small place near the northern extremity of the län, has a good harbour, in which the produce of the iron-mines of Dannemora is shipped.—*r. Upsala Län* (population, 85,294) has for its chief town UPSALA, with 4897 inhabitants.

14. *Vestmanland*, W. of Upland and E. of Nerike, contains a small part of the central agricultural region, and a larger part of the region of mines. At Sala are the richest silver-mines in Sweden. There are also iron, copper, and lead mines. This province forms—*s. Westeras Län* (population, 92,494). *Westeras*, the chief town, is built on an arm of lake Mälar, and carries on a considerable commerce in iron. It has 3344 inhabitants, tobacco manufactories, and dye-houses. Sala, N. of Westeras, has 2916 inhabitants. *Strömsholm*, a royal palace, is built on the banks of lake Mälar, S.W. of Westeras, where the Strömsholms Canal joins the lake.

15. *Dalarne*, or Dalecarlia, is noticed under DALECARLIA. It constitutes—*t. Falu Län* (population, 138,141), which is named from its chief town FALUN.

III. *Norrland* extends over the three mountain-regions, with the exception of a part of the southern, which is included in Dalecarlia. It is composed of eight provinces, which form 5 läns.

16. *Gestrikland* constitutes the north-eastern portion of the region of the mines. It has good forests and mines, and forms the southern part of Gefle Län.—17. *Helsingland*, north of Gestrikland, within the southern mountain-region, produces rye and barley, and has good forests and mines. It forms the northern part of Gefle Län.—*u. Gefle Län* (population, 109,794) has *Gefle* for its capital, which is built on a small inlet of the Gulf of Bothnia. It is one of the best-built towns of Sweden, has 8200 inhabitants, an excellent harbour, and a school for navigation. The commerce is considerable; 84 vessels entered and 116 left the harbour in 1849. The exports consist of

iron, timber, tar, flax, and linen; and the imports of corn and salt. *Söderhamn*, at the head of a narrow inlet of the Gulf of Bothnia, has 1629 inhabitants, and exports butter, flax, and linen.

18. *Medelpad*, and 19. *Angermanland*, form—*v. Hernösand Län* (population, 85,875), which has unrivalled coast scenery—high hills separated by narrow valleys, lakes, or inlets of the sea. About 25 miles inland the country rises and includes a plain forming part of the Jemtland, and reaching to the boundary of Norway. The Angerman-Elf, which drains the northern and central part of the län, is the largest river in Sweden, and is navigable by merchant vessels up to Sollefta, nearly 60 miles from its mouth. Higher up the navigation is impeded by cataracts. The scenery along this river is said by Dr. Clarke to rival the scenery of the finest part of the Rhine. The southern part of the län, which is formed of Medelpad, is drained chiefly by the Indals-Elf, which is the outlet of the Storsiön Lake. This is the most impetuous river in Sweden, full of rapids and cataracts; its inundations are sometimes very disastrous. The Ljungan-Elf, which receives the Giman, and enters the sea to the south of Sundswall, has been rendered navigable in parts. The fresh and salt-water fisheries, cattle-feeding, wood-cutting, and agriculture, are the chief occupations. Rye, barley, oats, flax, potatoes, and hemp, are the chief crops. Horses, sheep, and goats, are pretty numerous. Large timber is floated down the rivers, sawed into planks, and exported. Some tar is made. *Hernösand*, the chief town is situated on the island of Hernö, at the mouth of the Angerman-Elf, and united to the mainland by a bridge. It has a good harbour, some trade in planks, deals, and linen, and 2100 inhabitants. The *strömling*, or small herring fishery, is actively plied along the coast here. *Sundswall*, situated in a pleasant valley in the Medelpad, and on the shore of the bay into which Ljungan-Elf discharges its waters, is a small town with about 1800 inhabitants.

20. *Herjedälen* consists only of the high narrow valley of the upper Ljusnan-Elf, and extends to the declivity of Mount Sylfiellen. It has some iron-mines.—21. *Jemtland* contains the table-land which derives its name from it, the upper valley of the Ljungan-Elf, and a large mountain-tract which lies north of the table-land, and contains the upper valleys of the rivers Indals and Angerman. These two provinces form—*w. Oestersunds Län* (population, 45,769), which has for its chief town *Oestersund*, a small village on the eastern shore of lake Störsion.

22. *Westerbotten*, and—23. The Lapmarks, viz. Asele, Umea, Pitea, Lulea, and Tornea Lapmark, constitute the two läns of—*x. Umea* (population, 57,164), and—*y. Pitea* (population, 46,767), which are noticed under Bothnia and Lapland.

Manufactures—have been fostered in Sweden by a system of prohibitions and severe restrictions. The most important industrial establishments are confined to the large towns. Stockholm has large sugar-refineries, cotton and silk factories, tanyards, woollen-cloth mills, &c. Norrköping is the chief centre of the woollen manufactures. Steam machinery and mill-work are manufactured in Motala, Stockholm, and Nyköping, which last has also large iron foundries. Tobacco is extensively manufactured in most of the large towns. Other products are paper, cotton yarn, glass, morocco leather, printed cottons and linens, seed oils, pottery and chinaware, linen, soap, sail-cloth, silk ribands, &c. Göteborg has important breweries, sugar-refineries, and sail-cloth factories. The total number of workmen employed in the various factories amounted to about 17,000 in 1842, in which year the aggregate amount of the goods manufactured in these establishments was over 16 millions of rix-dollars. Very few of the articles named are exported from Sweden, and none to any considerable amount; nor of many of the most important items is the supply sufficient for the demand. In consequence of this last consideration, of the nature of the soil and climate which are unfavourable to agricultural pursuits, of the long winter, and the great distance in most instances from the towns, the Swedish peasant is of necessity himself a handicraftsman and manufacturer; and very few persons, comparatively speaking, are exclusively devoted to technical trades. The most important articles of peasant industry are—the coarse woollen stuffs of Dalecarlia and West Gothland in which the country people are clad; the linen of West Gothland and Helsingland, and the damasks and fine linens of Angermanland; the stockings, pottery, turnery, and woodwork of West Gothland and Schonen; and the wooden clocks of Dalecarlia; all of which enter largely into the internal trade of the country. In Wenersborg-Län alone, in 1842, above 7,000,000 ells of linen (2 feet each) were sold; and Helsingland furnished 2,250,000 ells. Breweries and distilleries are to be found in most of the towns; and most of the towns on the coast have shipbuilding yards.

Commerce.—The internal commerce, which is considerable, in corn, salt, fish, whisky, bricks and tiles, linens, and other manufactured goods, is facilitated by excellent roads, the rivers and canals before mentioned, and in winter by the whole country being covered with snow—a circumstance which renders the conveyance of goods in sledges easy and expeditious. The Swedes are much given to a seafaring life. Their vessels visit most of the countries contiguous to the Atlantic, and they are also employed in the carrying trade between other countries, especially in the Mediterranean, and on the coasts of South America. The imports consist of fish from Norway; butter, tallow, and provisions from Finland; hemp, flax and hemp seed, linseed oil, hides, tallow, and peltry from Russia; corn, wool, cattle, and provisions from Denmark; colonial produce, dye-stuffs, spices, and manufactured goods, from England and the Hanse towns; fruit, cattle, corn, and manufactured articles from Mecklenburg and Prussia; wine, fruits, oil, and silk from France; tropical fruits and salt (an important article, which Sweden does not produce) from Portugal and Spain; colonial produce and dye-stuffs, drugs, hides, tobacco, and rum, from America and the East Indies.

The principal articles of export are—bar and pig iron, nails and other wrought iron; boards, planks, logs and spars, staves, tar; some copper, brass, alum, manganese, paper, and linen and hempen fabrics. The value of the imports in 1844 amounted to 17,487,000 Swedish rix-dollars; the value of the exports in the same year was 21,630,000 rix-dollars. In that year 5445 vessels entered Swedish harbours, 3677 of which were Swedish, and 839 Norwegian; the mercantile marine of Sweden numbered 940 vessels, 738 of which, with 139,990 tons burthen, were engaged in the foreign trade.

Revenue; Army; Navy.—The total revenue of Sweden in 1849 was 10,600,000 dollars; the expenditure was nearly 12,000,000 dollars. The army numbered 34,363, with a reserve of 95,411 men. Most of the expense of the land force and of the civil service is defrayed by the domain lands of the crown, and by various subsidies and contributions not included in the general revenue. The fleet numbered 10 ships of the line, 8 frigates, 8 brigs, 6 schooners, 8 bomb ketches, 22 transports, 256 gun-boats, and 12 steamers.

Religion and Education.—The state religion of Sweden is the Evangelical-Lutheran. To this the whole population conforms, with the exception of a small number of Catholics and Jews, who are barely tolerated. The hierarchy consists of an archbishop and 11 bishops, under whom are provosts and rectors of parishes, in each of which by the law of 1842 there must be a school. These parish schools are supported partly by the state out of the proceeds of the poll-tax. A person must know how to read and must be able to say his catechism by heart, or he will not be admitted to receive the sacrament; and whoever has not received the sacrament is not allowed to marry. This regulation will account for the almost universal acquaintance with the elements of knowledge among the Swedish peasantry. Sweden has two universities, Upsala and Lund. The number of grammar-schools is considerable. It is stated on authority, that of every 1000 persons only one is unable to read.

History.—The early history of Sweden, as of the other Scandinavian nations, is known chiefly from the Sagas, or chronicles, which present little more than a confused mass of fables and heroic legends. The first ascertained dynasty of kings is that of the Ynglings (so called from the third of their number, Freyer-Yngve, a grandson of Odin), who reigned from the arrival of Odin in the north, an event variously fixed at from B.C. 50 to A.D. 250, till about A.D. 630, when the last of these princes, Olaf Trætelia, was expelled by Ivar Vidfadme, a Danish king of the race of the Skioldungs, another branch of the progeny of Odin. The thrones of Sweden and Denmark continued for some time united under the descendants of Ivar Vidfadme, till at the death (794) of the famous pirate-king Ragnar Lodbrok, Sweden again became a separate kingdom under his second son Biorn Ironside. Under Biorn II., grandson of Biorn Ironside, Christianity was first introduced into Scandinavia; but the mass of the people still adhered to paganism. Olaf however (who reigned 1001–26) formally established the Christian faith. The male descendants of Biorn Ironside having become extinct on the death of Edmund Slemme (1051–6), a fresh dynasty was founded by Stenkill, under whom the Swedes and Goths were for the first time united. On the death of Inge II., the last of the princes of this line, the Swedes conferred the royal dignity on a private individual named Sverker (1129–50); while to obviate the discontent of the Goths, who supported the claims of Erik (afterwards canonised), a descendant by females of the house of Stenkill, it was agreed that Erik should succeed Sverker, and that the representatives of the two families should in future reign alternately. This arrangement was adhered to through several reigns, although it was the cause of endless dissensions and civil wars; but in 1250, the male line of both families having become extinct, Waldemar (1250–76), of the Folkungar family, a descendant of Erik by the female side, was raised to the throne by election of the states, the government being confided during his minority (till 1266) to his father, Birger Jarl, who founded Stockholm (1254). Waldemar was dethroned by his brother Magnus Ladulæs (1276–90); and the reign of his son Birger (1290–1319) was again a scene of fraternal discord, ending in his deposition in favour of his infant nephew Magnus Smek (1319–63), who also succeeded in right of his mother to the crown of Norway. He was deposed by the Diet in 1343, and his son Erik XII. substituted; and though restored on the death of Erik in 1359, he was soon finally displaced by his sister's son, Albert of Mecklenburg (1363–89). Albert was overthrown and made prisoner (1389) by Margaret, surnamed the Semiramis of the North, queen of Norway and Denmark.

This remarkable princess was daughter of Waldemar Atterdag, the last male of the ancient Danish kings, and widow of Hakon, king of Norway, a son of Magnus Smek. On the death of her son Olaf (1387) she had been declared queen-regnant of these two kingdoms; and having by the fall of Albert become mistress of Sweden, she formed the three northern realms into a confederate monarchy by the famous Union of Calmar (1397). Margaret was succeeded by her grand-nephew Erik of Pomerania (1413–39), but his tyranny irritated the Swedes: the Swedish Tell, Engelbrekhtson, expelled the Danes in 1433, and Charles Knutson Bonde was elected administrator of the kingdom. On the death of Christopher of Bavaria, the successor of Erik, he assumed the royal title as Charles VIII. (1448–70); but though unable to maintain himself as king, the office of administrator was revived in his nephew Sten or Stephen Sture (1471–1505), under whom the university of Upsala was founded (1476), and printing introduced (1483). The rule of this chief and of his successors, Svante Nillson Sture (1505–12), and Sten Sture II. (1512–20), is marked by the incessant efforts of the Danish kings to render their supremacy over Sweden effectual, either by policy or arms; till Christian II., aided by the powerful family of Trolle, which was at feud with that of Sture, defeated and slew

Sten Sture II. at Bogesund, and massacred at Stockholm (Oct. 8, 1520) ninety-four prelates, senators, and nobles of the opposite party. The Swedes now flew to arms under Gustavus Erickson Vasa [GUSTAVUS ERICKSON], and the Union of Calmar came to an end.

With the establishment of the dynasty of Vasa, the history of Sweden, as an independent kingdom, may be said to commence; and the new æra was further marked by a change of religion. The Lutheran doctrines had been introduced in 1522 by Olaus Petri, and in 1528 the Confession of Augsburg was solemnly adopted as the standard of faith by the king and people at the diet of Westeras, at which the peasants first appeared as a fourth and separate estate. By the 'Act of Hereditary Union' (1540) the crown was settled on the male heirs of the king, under whose wise policy the country attained a degree of affluence and prosperity hitherto unknown. But Erik XIV. (1560-8), son and successor of the great Gustavus, was a gloomy and cruel tyrant; he was deposed by the states in favour of his brother John III. (1568-92), who confined Erik in a dungeon, and at length (1577) put him to death. John was succeeded by his son Sigismund (1592-1604), who had, in 1587, been elected king of Poland in right of his mother: but his open profession and patronage of Catholicism speedily alienated the Swedes, and a civil war commenced, which continued at intervals till 1604, when the diet of Norrköping formally prohibited the obnoxious faith, and raised the Duke of Sudermania to the throne as Charles IX. (1604-11) in the place of his nephew. From this revolution arose the Swedo-Polish war of succession, which continued almost without intermission for 60 years (1600-60. Gustavus Adolphus, who succeeded his father Charles IX. in 1611, by the peace of Stolbova (1617) acquired all the remaining territory of Russia on the Baltic. He also took Riga in 1621, and subdued Livonia and Polish Prussia, which were ceded to Sweden (1629) by the truce of Altmark. His arms were now turned towards Germany, and being chosen captain-general of the Protestant league, he landed in Pomerania, June, 1630; but the campaigns and victories of Gustavus Adolphus, till his fall in the moment of triumph at Lützen (Nov. 6, 1632), belong to German rather than Swedish history. [GUSTAVUS ADOLPHUS.]

Christina (1632-54), the daughter of Gustavus Adolphus, succeeded at the age of six years. [CHRISTINA.] After her abdication the new king, Charles Gustavus (1654-60) renewed the war with Poland, which he completely overran, taking Warsaw, Cracow, &c. The ill success of his subsequent attempts to subdue Denmark is said to have hastened his death. During the minority of his son Charles IX. (1660-97), the long contest with Poland was concluded (1660) by the peace of Oliva. Livonia, Esthonia, and Oesel were confirmed to Sweden, and the claim of the Polish kings to the Swedish crown was given up. This reign was the epoch of the first struggle between the crown, supported by the burghers and peasants, and the power of the senate and nobles. The resumption of the crown lands (1680), and the liquidation of the public debt by raising the value of the currency (1686), were the preliminary measures; and in 1693 the king was formally declared absolute by an act of the Diet. He died in 1697, leaving his dominions to his son, the famous Charles XII. (1697-1718) [CHARLES XII.], who was killed at the siege of Fredericks-hall in Norway, leaving his kingdom on the verge of ruin. His sister Ulrica-Eleonora (1718-20), was compelled to restore the constitution as before 1693; but in 1720 she resigned the crown in favour of her husband Frederic of Hesse-Cassel (1720-51). The treaty of Nystad with Russia (1721) at length gave peace to the exhausted kingdom; but Ingria, Livonia, Esthonia, Carelia, Oesel, &c., were ceded to the Czar.

For the next twenty years the court of Stockholm was a scene of foreign intrigue and corruption, in which the Hats, or French party, and the Caps, or Russian faction, alternately predominated. The ascendancy of the Hats led to a war (1741) with Russia, but the Swedes were everywhere defeated, and the peace of Abo (1743) was obtained by the cession of part of Finland, and the recognition of Duke Adolphus Frederic of Holstein-Gottorp as heir to the throne, the king being childless.

The reign of Adolphus Frederic (1751-71) was peaceful in its foreign relations, with the exception of the share taken against Prussia, through the influence of the Hats, in the Seven Years' War: but the struggles of the Hats and Caps kept the nation in a constant ferment, and the thraldom of the king by the nobles was carried to such an extent as to produce a threat of abdication (1768). The counter-revolution did not take place however till the reign of his son Gustavus III. (1771-92). [GUSTAVUS III.] After the assassination of Gustavus III. in 1792, the multiplied misfortunes which befell this country were ascribed to the incapacity of the new king [GUSTAVUS IV]; and he was deposed (March, 1809), his uncle Charles XIII. (1809-18) being called to the throne to the exclusion of the son of Gustavus. A few aristocratic modifications were introduced in the constitution; but the general outline was left as settled in 1772. The peace of Fredericksham with Russia (1809) was purchased by the cession of Finland, East Bothnia, and Aland (or nearly one-fourth of the territory, with one-third of the population, of the kingdom): but France restored Pomerania (1810) on the adoption of the continental system prescribed by Napoleon. The sudden death (1810) of the prince of Holstein-Augustenberg (who had been declared heir to the throne), and the age and childlessness of the king, necessitated a fresh election of a crown-prince; and the choice of the states fell on Bernadotte. [CHARLES XIV.] Bernadotte died, March 8, 1844, and was succeeded by his son, Oscar I., the present sovereign.

The Swedish constitution, after its repeated fluctuations between absolute monarchy and aristocratic predominance, may be considered as having settled, since the last modifications in 1809, into a tolerably fair equilibrium. The crown is de-

clared hereditary in the male line, and the king is required to profess the Lutheran religion, which is the established creed of the realm. He has a negative voice on the resolutions of the diet, and the right to introduce measures for their consideration: but he can neither control the freedom of their deliberations, nor (without their sanction) impose new taxes, contract loans, or alienate any part of the territory.

(Von Buch's *Travels through Norway, Lapland, and Sweden;* Thompson's *Travels in Sweden;* Everest, *Travels through Norway, Lapland, and part of Sweden;* Schubert's *Reise durch Schweden, Norwegen, Lapland, &c.;* Forsell's *Statistik von Schweden;* Forsell's *Anteckningar ofver Sverige,* Stockh., 1839.)

SWEDENBORG, EMANUEL, the eldest son of Jesper Swedberg, bishop of Skara, in Sweden, was born at Stockholm, Jan. 29, 1688. Of his youth there is no record, excepting that his mind was early occupied by religious subjects. Bishop Swedberg bestowed great care on the education of his son, which he received principally at the university of Upsala, and there he studied the learned languages, mathematics, and natural philosophy. At the age of twenty-two he took his degree of doctor of philosophy, and published the academical dissertation which he had written for the degree on the Mimi of Seneca and P. Syrus, and others.

In 1710 Swedberg came to England, and spent some time at Oxford. He lived afterwards for three years chiefly in Utrecht, Paris, and Greifswalde, returning to Sweden in 1714, through Stralsund, just as Charles XII. was commencing the siege of that city. His next productions were, a small volume of fables and allegories in Latin prose, and a collection of Latin poems. In 1716 Swedberg commenced his 'Dædalus Hyperboreus,' a periodical record of inventions and experiments by Polhem, the great Swedish engineer, and others, and of mathematical and physical discoveries of his own. In 1716 Swedberg was invited by Polhem to repair with him to Lund to meet Charles XII., on which occasion he was admitted to much intercourse with the king, who appointed him assessor in the Royal Metallic College of Sweden, and directed that he should accompany and assist Polhem in constructing his mechanical works, among which were the locks between Wener Lake and Göteborg.

The 'Dædalus Hyperboreus' was completed in 1718, in which year Swedberg transported over mountains and valleys, on rolling machines of his own invention, two galleys, five large boats, and a sloop, from Strömstadt to Iderfjol, a distance of fourteen miles, in order to forward the siege of Frederickshall. Swedberg's next literary works were—'The Art of the Rules' (an Introduction to Algebra, of which a full analysis may be seen in the 'Acta Literaria Sueciæ,' vol. i.); only a part of this work was published; 'Attempts to find the Longitude of places by means of the Moon.' These treatises were both in Swedish, and were both published at Upsal in 1718.

In 1719 the family was ennobled by Queen Ulrica Eleonora under the name of *Swedenborg,* From this time he took his seat with the nobles of the equestrian order in the triennial assemblies of the states. In this year he published three works in Swedish: 'A Proposal for a Decimal Arrangement of Coinage and Measures, to facilitate Calculation and suppress Fractions' (Stockholm); 'A Treatise on the Motion and Position of the Earth and Planets' (Skara); 'Proofs derived from appearances in Sweden, of the depth of the Sea, and the greater Force of the Tides in the earliest ages' (Stockholm). Occasional papers by him appeared in the 'Acta Lit. Suec.' for 1720-21.

In the spring of 1721 he again went abroad through Denmark to Holland, and published a number of small works at Amsterdam. From Amsterdam he went to Aix-la-Chapelle, Liège, and Cologne, and visited the mines and smelting-works near those places. He arrived at Leipzig in 1722, and there published 'Miscellaneous Observations on Natural Objects, particularly Minerals, Fire, and Mountain-Strata;' and at Hamburg, during the same year, he published a continuation 'On Minerals, Iron, and the Stalactites in Baumann's Cavern.' ('Act. Eruditor. Lipsiens.,' 1723, p. 96-7.) This work, like those which preceded it, shows a rare power both of accumulating facts and applying principles. After being abroad a year and three months, he returned home, and in the course of 1722 he published anonymously, at Stockholm, a work 'On the Depreciation and Rise of the Swedish Currency' ('Cat. Bibl. Upsal,' Upsal, 1814); and at the end of the same year he entered on the actual duties of the assessorship, the functions of which he had been unwilling to exercise before he had perfected his knowledge of metallurgy. For the next ten years he divided his time between the business of the Royal Board of Mines and his studies. In 1729 he was admitted a member of the Royal Academy of Sciences at Upsala. In 1733 he again travelled into Germany. It seems from his posthumous 'Itinerarium' (edited by Tafel, Tübingen, 1840) that he visited Berlin, Dresden, Prague, and Carlsbad, and, arriving at Leipzig at the end of the year, put to press a great work he had just completed. During the printing of this work he spent twelve months in visiting the Austrian and Hungarian mines.

Swedenborg's 'Opera Philosophica et Mineralia' were published in 1734, in 3 vols. folio, at Dresden and Leipzig; his patron, the Duke of Brunswick, at whose court he was a visitor, defrayed the cost of the publication. This large work consists of three distinct treatises. The first volume contains 'Principles of Natural Philosophy, consisting of new attempts to explain the phenomena of the elemental world in a philosophical manner' ('Principia Rerum Naturalium,' &c.). The second and third volumes are together called the 'Regnum Minerale;' the second is on iron, the third on copper and brass. They treat of the methods employed in all parts of Europe, and in America, in preparing and working these metals. In the same year, and at the same places, Swedenborg published 'An Introduction to the Philosophy of the Infinite, and the Final Cause of Creation; treating also of the Mechanism of the Operation between

the Soul and the Body' ('Prodromus Philosophiæ Ratiocinantis de Infinito, et Causâ Finali Creationis; deque Mechanismo Operationis Animæ et Corporis').

It established his reputation throughout Europe. Christ. Wolff and other foreign literati eagerly sought his correspondence; and the Academy of Sciences of St. Petersburg appointed him a corresponding member. In 1736 he again travelled. The journal of his tour, from 1736 to 1739, is in MS. in the Academy at Stockholm. At this time he applied himself to anatomy and physiology, of a masterly acquaintance with which he gave evidence in his 'Œconomia Regni Animalis,' a large work in two parts, 4to., which he published at Amsterdam in 1740-41. In 1741 he became a fellow of the Royal Academy of Sciences of Stockholm. He still continued earnest in the pursuit of physiology, and in 1744 published the 'Animal Kingdom' ('Regnum Animale'), parts i. and ii., 4to., at the Hague, and in 1745, part iii., in London.

At the beginning of 1745 Swedenborg published in two parts, 4to., 'The Worship and Love of God' ('De Cultu et Amore Dei'); the first part, on the origin of the earth, on paradise, and the birth, infancy, and love of the first man; the second part, on the marriage of the first man, and on the soul, the intellectual mind, the state of integrity, and the image of God.

Swedenborg continued to write industriously on various subjects of natural philosophy, and many of his MSS. are preserved in the Royal Academy of Sciences at Stockholm; but his career may be dated from the publication of the 'Prodromus Principiorum.' In this work he attempted to account for chemical combination by a theory of the forms and forces of the particles of bodies, and to resolve chemistry into natural geometry, that it might have the benefit of first principles, and the rank of a fixed science. Of these forms he gave many delineations.

In applying the rules which he proposed for investigating the constitution of the magnetic, luminous, and atmospheric elements, Swedenborg boldly averred that the records of science, accumulating as they had been for thousands of years, were sufficient for an examination of things on principles, and *à priori*. ('Principia, de Mediis ad Ver. Philos.,' p. 3, 4.)

In approaching the human body he again insisted on the necessity for principles and generalisation, without which, he said, 'facts themselves would grow obsolete and perish;' adding that, 'unless he were much mistaken, the destinies of the world were leading to this issue.' A knowledge of the soul became the professed object of his inquiry. In his search he repudiated synthesis, and 'resolved to approach the soul by the analytic way.' We shall content ourselves with a brief illustration of one of those doctrines which, 'with the most intense study,' he elaborated for his guidance, we mean the 'doctrine of series and degrees.' Each organ, he observed, commences from certain unities or least parts which are peculiar to it, and derives its form from their gradual composition, and its general function from the sum of their particular functions. The mass is therefore the representative of its minute components, and its structure and functions indicate theirs. The vesicles or smallest parts peculiar to the lungs are so many least lungs; the biliary radicles of the liver, so many least livers; the cellules of the spleen, so many least spleens; the tubuli of the kidneys, so many least kidneys; and the same function is predicable of these least, as of their entire respective organs, but with any modification which experience may declare to be proper to the minuter structures. This new method of analysis, in which the greatest things were presumed to indicate the least, with just such reservation as our experience of the least necessitates, was designed to throw light on the intimate structure and occult offices of single organs—the same way identified the higher with the lower groups of organs—the cranial with the thoracic, and both with the abdominal viscera.

On the whole we may admit these works to be an attempt to combine and re-organise the opinions of all the schools of medicine since the days of Hippocrates. His works however are a dead letter to the medical profession, or known only to its erudite members through the ignorant misstatements of Haller. (Haller's 'Bibliotheca Anatomica,' tom. ii., pp. 328, 329, Tiguri, 1777.)

Swedenborg was in his fifty-eighth year when he published the last of the foregoing volumes, and from this period he assumed a new character, of which he gave the following account:—'I have been called to a holy office by the Lord, who most graciously manifested himself in person to me, his servant, in the year 1745, and opened my sight into the spiritual world, endowing me with the gift of conversing with spirits and angels.' The event alluded to happened in the middle of April, 1745, at an inn in London. From this period, Swedenborg entirely forsook science, nor does he once allude, in his works on theology, to his former scientific labours. He still however took part in the proceedings of the Swedish Diet, and in that of 1761 he is stated by Count Hopken to have presented the best memorial on the subject of finance.

He returned from London to Sweden in Aug., 1745, and devoted himself to the study of Hebrew and the perusal of the Scriptures. He continued to discharge the duties of assessor of the Board of Mines till 1747, when he obtained permission to retire, retaining as a pension the salary of the office. During the remainder of his life, which was passed partly at London and Amsterdam, Swedenborg gained many believers in his doctrines among the most distinguished men of the day. Bishop Filenius and Dr. Ekebon instigated a prosecution against him in the consistory of Göteborg, whence it was transferred to the diet; but Swedenborg came out of these trials with safety, unaccused by the diet, and protected by the king. Towards Christmas, 1771, while in London, he had a stroke of the palsy, from which he never perfectly recovered. Swedenborg died in Great Bath Street, Coldbath Fields, March 29, 1772. His body was buried in the Swedish church in Ratcliff Highway.

Swedenborg's theological works are numerous.

As a specimen of his interpretation of the Holy Scripture, the reader may consult the 'Apocalypse Revealed;' for a concise view of his alleged experiences, the 'Heaven and Hell' may be resorted to; for a view of that part of his system which relates to the creation and government of the universe, we recommend the perusal of the 'Divine Love' and the 'Divine Providence;' for his doctrine concerning the relation of the sexes, and its eternal origin and perpetuity, and for his code of spiritual legislation on marriage and divorce, see the 'Conjugial Love,' one of the most remarkable of these works: finally, the student will find a compendium of the whole of the theology of the New Church in the 'True Christian Religion,' the last and perhaps the finest of the writings of Swedenborg. The whole of the theological works, originally published in Latin, have been translated into English, and some of them have passed through several editions both in England and in America. We must refer the reader to them for an account of his religious doctrines. Swedenborg's Theological MSS., which are preserved in the Royal Academy at Stockholm, are very voluminous.

SWEDENBORGIANS, the people who believe in the mission of Emanuel Swedenborg to promulgate the doctrines of the New Church signified by the New Jerusalem in the Apocalypse. In this country they may be divided into two portions, one of which forms the denomination known as such to the world; while the other portion remains without visible separation from the communion of the Established Church. The first public association of the Swedenborgians took place in 1788, in Great Eastcheap, London. Since that time societies have been formed in nearly all our large towns, until they now amount to between forty and fifty. These send delegates to an annual conference, which publishes the 'Intellectual Repository,' a periodical of thirty years standing, devoted to the cause. In the United States of America, France, Germany, Sweden, and in several of the British Colonies, Swedenborgianism has also taken root.

The non-separatist Swedenborgians comprise many members, and even clergymen, of the Church of England. The chief works in English in recommendation and in defence of his doctrines are those of Clowes and Hindmarsh; Noble's 'Appeal in behalf of the Doctrines of the New Church' and 'Plenary Inspiration of the Sacred Scriptures;' Clissold's 'Letter to the Archbishop of Dublin on the practical Nature of the Doctrines and alleged Revelations of Swedenborg,' and 'Illustrations of the End of the Church, as predicted in Matthew, c. xxiv., with Remarks on the Time of the End,' London, 1841. The Swedenborgians have several public institutions for propagating their doctrines. There are two Liturgies in general use among the Swedenborgians: the 'Book of Worship,' Boston, United States, and chants from the Psalms; and the 'Liturgy of the New Church, prepared by order of the General Conference,' London, which is used throughout this country, and contains a more formal service than that adopted in America. In the latter will be found the twelve 'Articles of Faith,' 'condensed from the Writings of Swedenborg, adopted by the General Conference, and recognised as a standard of Doctrine by the whole body of Swedenborgians.'

SWEET BRIAR. [ROSA.]

SWEET WILLIAM. [DIANTHUS.]

SWIETEN, GERARD VAN, was born at Leyden in 1700. He received his education there and at Louvain, and studied medicine at Leyden under Boerhaave, by whose influence he was appointed to a professorship of medicine very soon after taking his diploma of doctor in 1725. His lectures were well attended, but objections were made against him on the ground of his being a Roman Catholic, and he was obliged to resign his chair. In 1745 Maria Theresa of Austria appointed him her first physician, and in this capacity he used his influence to establish a system of clinical instruction at Vienna, to rebuild the university, and accomplish many other important measures for the advancement of science. He died in 1772, and Maria Theresa had a statue to his memory placed in the hall of the university.

Van Swieten wrote a work of great erudition entitled 'Commentaria in Hermanni Boerhaavii Aphorismos de Cognoscendis et Curandis Morbis:' it was first published at Leyden, in 5 vols. 4to., between 1741 and 1772; and has since been repeatedly edited in Latin, English, French, and German.

SWIETE'NIA, a small genus of plants of the natural family *Cedrelaceæ*, named by Jacquin in honour of G. van Swieten. *S. febrifuga* of Roxburgh has been formed into a new genus *Soymida*. *S. Senegalensis* has also been formed into a new genus, *Khava*, and is the tree yielding African mahogany, which is brought to us from Sierra Leone. The timber, though hard, is liable to warp, but it is employed where a hard and cheap wood of large size is required, as for mangles. The negroes employ an infusion of the bark, which is very bitter, as a febrifuge. *S. chloroxylon* is a third species, which has been formed into a new genus, and is now *Chloroxylon Swietenia*, a native of the mountainous parts of the Circars in the East Indies. It is the tree yielding the beautiful East Indian Satin-Wood, which is of a deep yellow colour, close-grained, heavy, and durable. *S. Chikrassee*, now *Chikrassia tabularis*, is a fourth species, formed into a new genus. This is another Indian tree which is greatly admired for its beauty: the wood is very light coloured, close-grained, and most elegantly veined, and much employed for furniture or cabinet-work. The most important species however, and that which now nearly alone constitutes the genus, is *Swietenia mahagoni*, Mahogany, a native of Campeachy and of the West Indies. The timber, which is so well known from its extensive employment for furniture and cabinet-making, is of a reddish brown colour, of different degrees of brightness, much mottled and streaked, very little liable to shrink or warp, free from taste or smell, except when kept for some time, when it acquires an agreeable odour, from the exudation of a semi-resinous juice, which serves to preserve the wood

from the attacks of insects. It does not appear to have been imported into this country before 1724. The quality of the wood varies much, according to the situations in which it grows: that which is produced on rocky soil and exposed situations is the best. Spanish mahogany is imported in logs of about 10 feet long, and from 20 to 26 inches square. The elevated parts of the West Indies and the Spanish Main produce a wood which is close-grained, and of a darker colour than the Honduras mahogany. This is imported in logs of from 2 to 4 feet square, though both kinds are no doubt produced by the same species.

SWIFT, JONATHAN, D.D., was descended from a family which was originally settled in Yorkshire. His grandfather, the Rev. Thomas Swift, was vicar of Goodrich in Herefordshire. His father was bred to the law, and in 1665 was appointed steward of the King's Inns, Dublin. He died in 1667, leaving his widow in great poverty, with an infant daughter, and pregnant with the future dean of St. Patrick's.

Jonathan Swift was born in Dublin, Nov. 30, 1667. When about a year old, he was carried to Whitehaven, in Cumberland, where he remained with his nurse for nearly three years. At the age of six, he was sent to the school of Kilkenny, whence he was removed to Trinity College, Dublin, where he was received as a pensioner, April 24, 1682. The cost of his education and maintenance was defrayed successively by two uncles. The degree of B.A. was conferred on Swift, Feb. 15. 1785. He remained at Trinity College till 1688, when he came to England, and soon afterwards went to Sir Wm. Temple, at Moor Park in Surrey, a relation of his mother's, who admitted him into his family, and employed him as his private secretary.

Swift went to Oxford in 1692, and entered himself of Hart Hall, for the purpose of taking his degree of M.A., to which he was admitted July 4 in that year. He soon after began to tire of his state of dependance, and represented his case to Sir William, who offered him a situation worth 100*l.* year in the rolls in Ireland. Swift declined the offer, and said he preferred the church. They were both displeased, and so parted. Swift went to Ireland, was admitted to deacon's orders, Oct. 18, 1694, and to priest's orders, Jan. 13, 1695. Soon afterwards Lord Capel, then lord-deputy of Ireland, bestowed upon him the prebend of Kilroot, in the diocese of Connor, worth about 100*l.* a year; but in a short time Swift yielded to a pressing invitation from Sir W. Temple, and returned to Moor Park, where he continued to reside till Sir William's death, Jan 27, 1698. Some time before his death, Temple had obtained from King William a promise that Swift should have a prebend of Canterbury or Westminster: Sir William also left him a legacy, with the task of editing his posthumous works.

During the early part of his residence at Moor Park, Swift wrote some Pindaric Odes, and a great number of other things nearly all of which he destroyed. Among those which he preserved was 'The Battle of the Books in St. James's Library.' Swift is supposed to have likewise finished about this time his 'Tale of a Tub,' one of his most laboured and most perfect works.

It was during Swift's second residence at Moor Park that the acquaintance commenced between him and Miss Esther Johnson, more generally known by the poetical name which he gave to her of Stella. Miss Johnson was then about thirteen years of age, and Swift about thirty. He assisted in her education, which appears to have been little attended to previously, and she acquired a fondness for her tutor.

Swift, some years previously to his acquaintance with Miss Johnson, had professed an attachment to Miss Jane Waryng, on whom he bestowed the title of Varina, and offered to marry her; but she declined on the plea of ill health. By degrees, as Swift's passion abated, hers grew warmer, and she wrote to express her willingness to accept his offer. Swift did not refuse to fulfil his promise, but laid down such conditions as to put an end to all further correspondence.

After Sir William Temple's death Swift repaired to London to superintend the publication of his patron's posthumous works, a task which he performed with care, and prefixed a Life of Sir William and a dedication to the king; but, finding that the king took no notice of the Works, the dedication, or himself, he accepted an offer made to him in 1699 by Lord Berkeley, one of the lords justices of Ireland, to attend him there as his chaplain and private secretary; but he was superseded in the latter office, and received as a compensation the rectory of Agher and the vicarages of Laracor and Rathbeggan, in the diocese of Meath, amounting together to 230*l.* a year. The prebend of Dunlavin was bestowed upon him in 1700, which increased his income to between 350*l.* and 400*l.* a year. While he resided in Lord Berkeley's family he produced, among other well-known works, 'The Humble Petition of Frances Harris,' and the 'Meditation on a Broomstick.'

In 1700, on the return of Lord Berkeley to England, Swift, who had continued in his office of chaplain, took possession of his living at Laracor. He performed his duties as a country clergyman with exemplary diligence, and expended a considerable sum in repairing the church. Swift had not been long in Laracor when it was arranged between Miss Johnson and himself that she should come to reside in his neighbourhood, which she did, accompanied by Mrs. Dingley, a widow, and a relation of the Temple family.

Swift appears to have passed over to England at least once a year, and remained two or three months, chiefly in London, where he officiated as chaplain in Lord Berkeley's family, but generally paid a visit to his mother at Leicester. In 1701, during the first of these annual visits, he published his first political tract, 'A Discourse on the Contests and Dissentions between the Nobles and Commons at Athens and Rome,' which, when he subsequently avowed himself its author, procured him admission into the society of the leading Whigs, who used then to assemble at Button's coffee-house. In 1704 Swift published anony-

mously the 'Tale of a Tub,' together with 'The Battle of the Books.' The 'Tale of a Tub,' which was generally supposed to be Swift's, made him some powerful enemies by its imputed irreligious tendency.

In 1708 Swift was employed by the Irish prelates to solicit a remission of the first-fruits for Ireland, which had already been granted in England. His application was made to Lord Godolphin, but was unsuccessful. During 1708 and 1709 Swift published several tracts. 'An Argument against abolishing Christianity,' is a piece of grave irony; 'A Project for the Advancement of Religion,' is the only work to which he ever put his name: it made a strong impression on the religious classes, and was very favourably received by the public.

On the change of ministry in 1710 the hopes of the Irish prelates were again revived for a remission of the first-fruits; and Swift was deputed, in conjunction with the bishops of Ossory and Killaloe, to solicit the boon. He left Ireland on this mission, Sept. 1, 1710; but found, on his arrival in London, that the bishops, who had gone to England before him, had left that country without having done anything.

Swift now found himself courted by the leaders of both parties, with the exception of Godolphin. Swift soon made up his mind to join the Tories, and accordingly accepted their overtures, and formed a close intimacy with Harley and St. John.

During the time that Swift remained in London on this occasion he wrote a Journal, or Diary, which was addressed in a series of letters to Miss Johnson and Mrs. Dingley, but obviously intended for the former. This Journal affords a picture as minute as it is evidently trustworthy of the events in which he was concerned and the thoughts which arose out of them.

'The Examiner,' a weekly periodical, had been begun by St. John, Prior, and others, in support of the new ministry. Thirteen numbers had been published with little effect, when it was taken up by Swift, Nov. 10, 1710, and was continued by him till June 14, 1711, a period of seven months, when he resigned it into other hands. Every one of these papers was written by himself, besides several satirical pamphlets.

It having become obvious that the existence of the Tory government depended upon making peace with France, Prior was sent to Paris to enter into a negociation for that purpose, and Swift, in furtherance of the same object, wrote 'The Conduct of the Allies,' which was published anonymously, Nov. 27, 1711, while the question of peace or war was under discussion in parliament. The sale of this tract was unprecedented at that time, four large editions having been exhausted in a week. The effect upon the public mind was such as to produce a determined spirit of opposition to the war. The Peace of Utrecht was concluded May 5, 1713, and Swift undertook to write the history of it, but the progress of the work was hindered by the growing dissension between Oxford and Bolingbroke. This work he afterwards expanded into the 'History of the Four last Years of Queen Anne's Reign,' but it was not published till 1758, some years after his death. While Swift was thus assisting his friends, he obtained nothing for himself but empty honour. He was too proud to make any direct solicitation; he was aware that Lord Oxford well knew that he expected no less a reward than a bishopric, but he was not aware that he had a private and obstinate enemy in Queen Anne, who had been taught by Archbishop Sharp that the supposed author of the 'Tale of a Tub' was little, if at all, better than an infidel. In the end however the deanery of St. Patrick's, Dublin, was bestowed on him, Feb. 23, 1713, and early in June the same year Swift set out for Ireland to take possession.

Swift was scarcely settled in his deanery when he received the most pressing invitations from the friends of the Tory administration to return to England, for the purpose of reconciling, if possible, Oxford and Bolingbroke. He came over to England without delay, and soon afterwards published 'The Public Spirit of the Whigs,' a bitter attack on Steele, as well as the party to which he belonged. Finding that Oxford and Bolingbroke could not be reconciled, Swift retired to the house of the Rev. Mr. Geary, Upper Letcombe, Berkshire, at the beginning of June, 1714. Here he wrote his 'Free Thoughts on the State of Public Affairs.' But the dismissal of Lord Oxford and the death of Queen Anne now put an end to the power of the Tories. Lord Oxford was arrested and imprisoned. Bolingbroke and Ormond fled to France, and Swift returned to Ireland.

Not long after Swift's visit to London to solicit the remission of the first-fruits, he was introduced to the acquaintance of Mrs. Vanhomrigh, the widow of Bartholomew Vanhomrigh, a Dutch merchant, who, at his death, had left to his widow a life interest in 16,000*l.*, which sum was afterwards to be divided equally among his children, two sons and two daughters. When Swift became intimate in this family, Miss Esther Vanhomrigh, the eldest daughter, was under twenty years of age, well educated, lively, graceful, spirited, and, unfortunately for Swift, with a taste for reading. He became the director of her studies, and their friendly intercourse was continued till Miss Vanhomrigh made a declaration of affection for him, and proposed marriage. How that declaration was received is related in Swift's poem of 'Cadenus and Vanessa.' Cadenus is decanus (dean) by transposal of letters, and Vanessa is the poetical name which he gave to Miss Vanhomrigh. The proposal was declined; but Swift, from vanity or fondness, or both, had not firmness enough to relinquish their affectionate intercourse.

At length, after Swift's return to Ireland, Mrs. Vanhomrigh died; her two sons died soon afterwards; and the two sisters retired to that country, where their father had left a small property near Cellbridge. Obscure murmurs of the intercourse between Swift and Vanessa had reached Stella soon after its commencement. In 1714 Vanessa arrived in Dublin. Stella's jealousy now became so restless that Swift is said to have consented to their marriage, and the ceremony was performed in 1716, in the garden of the deanery, by the

Bishop of Clogher; and though Swift never acknowledged the marriage, and no change took place in their intercourse, the evidence, though imperfect, is such as to leave little doubt of the fact. At length, in 1717, Vanessa and her sister retired to Marley Abbey, near Cellbridge, where Swift does not appear to have visited them till 1720. Vanessa by degrees became more impatient, and at length wrote to Stella, to inquire into the nature of her connection with Swift. Stella, highly indignant, sent the letter to Swift, and immediately removed to the house of a female friend near Dublin. Swift, in a paroxysm of rage, rode over to Marley Abbey, entered the room where Vanessa was sitting, without speaking flung the letter on the table, and immediately rode back to Dublin. Poor Vanessa sank under the blow. In a few weeks afterwards she died.

Swift, in an agony of shame and remorse, retreated to some place in the south of Ireland, where he remained two months without the place of his abode being known. On his return to Dublin, Stella was easily persuaded to forgive him. She continued to be the companion of his social hours, his comforter and attendant in sickness; and she presided at his table on public days; but they were never alone together: their union as husband and wife was merely nominal.

In 1720 Swift published 'A Proposal for the Universal Use of Irish Manufactures.' This honestly-meant tract was represented as a seditious libel: the printer was brought to trial; the verdict of the jury was 'Not guilty;' but Judge Whitshed kept them eleven hours, and sent them back nine times, till they reluctantly left the matter in his hands by a special verdict: the public indignation however was roused, and the government were obliged to relinquish the contest.

In 1723, there being a scarcity of copper coin in Ireland, George I. granted to William Wood a patent right to coin farthings and halfpence to the amount of 108,000*l.* The grant had been obtained by the influence of the Duchess of Kendal, the king's mistress, who was to have a share of the profits. The Irish parliament expressed their dislike to it by a remonstrance, of which no notice was taken; but a letter was published signed 'M. B., drapier (draper), Dublin,' and was followed by five or six more. The effect of these letters is known. All Ireland was roused. No one would touch the contaminated coin. A reward of 300*l.* was offered for the discovery of the author of the Drapier's fourth letter. A bill against the printer was about to be presented to the grand jury, when the Dean addressed to them 'Some Seasonable Advice.' The grand jury wrote 'ignoramus' on the bill, and Judge Whitshed could only vent his rage by dismissing them. Ultimately the patent was withdrawn, and Wood was compensated by a grant of 3000*l.* yearly for twelve years.

Swift's popularity was now unbounded. As if to shelter himself from this storm of public applause, he retired with Stella and Mrs. Dingley to Quilca, a country-house belonging to Dr. Sheridan, in a retired situation about seven miles from Kells, where he revised and completed the

'Travels into several remote Nations of the World, by Lemuel Gulliver.'

In 1726 Swift visited England again, for the first time since Queen Anne's death. He was introduced to the Princess of Wales by Arbuthnot, at her own particular request. His visits afterwards were frequent, especially when she resided at Richmond. Towards the end of 1726 'Gulliver's Travels' was published in London, anonymously as usual, through the agency of his friend Charles Ford. Such was the interest and admiration which it excited, that the price of the first edition was raised before the second could be printed.

Swift sustained a severe shock by the death of Stella, Jan. 28, 1728. When he again turned his attention to public affairs, he found Walpole still in power, and high in favour with the queen as well as the king. He now kept no terms with the court; he attacked Walpole especially, and the ministry generally, and did not spare even the king and queen.

In 1728–9 the Dean spent about a year with Sir Arthur Acheson, at his seat of Gosford, in the north of Ireland. Here he wrote several light pieces of poetry, which afforded evidence that age had not in the least impaired his peculiar powers of humour.

In 1735 he supported the clergy in their claim of the tithe of pasturage, or agistment tithe, in opposition to the Irish House of Commons, and gave vent to his indignation against the obnoxious members in one of the last but most animated and pointed of his satires, 'The Legion Club.' In 1736 Swift opposed the primate Boulter's scheme for regulating the exchange with Ireland by diminishing the value of the gold coin in order to increase the quantity of silver; he spoke against it in public; he wrote ballads against it; and on the day when the proclamation of the government for carrying the measure into effect was read, the bells of St. Patrick's Cathedral rang a muffled peal, and a black flag was seen to wave on the steeple.

Swift's public life may now be said to have closed. He had long been a great sufferer from vertigo and deafness. In 1741 his memory had almost failed, his mind was much impaired, and he became subject to violent fits of passion, which soon terminated in furious lunacy. He continued in this condition till 1742, when he sank into a state of quiet idiotcy, in which he continued till Oct. 19, 1745, when he died as gently as if he had only fallen asleep. The immediate cause of death, and probably of the giddiness which had so long afflicted him, was found to be water on the brain.

Swift left the bulk of his property to found and endow an hospital for lunatics and idiots, in James Street, Dublin. The funds which finally devolved upon the hospital amounted to about 10,000*l.* Swift in his youth was considered handsome: he was tall, muscular, and well-made; his complexion was dark, and his look heavy, but Pope says that his 'eyes, which were azure as the heavens, had an expression of peculiar acuteness.' His face was generally expressive of the stern decision of his character.

SWIFT, DEANE, was the grandson of Godwin Swift, the eldest of the uncles of the Dean of St. Patrick's. He studied at Trinity College, Dublin, and afterwards resided at Goodrich in Herefordshire. Deane Swift wrote an 'Essay upon the Life, Character, and Writings of Dr. Jonathan Swift; interspersed with some occasional Animadversions upon the Remarks of a late critical Author, and upon the Observations of an anonymous writer on these Remarks; to which is added that Sketch of Dr. Swift's Life, written by the Dr. himself, which was lately presented by the Author of this Essay to the University of Dublin,' Lond., 1755, 8vo. He also published 'The Works of Dr. Jonathan Swift, Dean of St. Patrick's,' London, 1765, 12mo., about 20 vols. Deane Swift contributed a portion of correspondence to Nichols's edition of Swift's Works, 19 vols. 8vo. He died at Worcester, July 12, 1783.

SWIFT, THEOPHILUS, was the son of Deane Swift, and was born at Goodrich in Herefordshire. He wrote 'The Gamblers,' a poem, 4to.; 'The Temple of Folly,' in 4 cantos, Lond., 1787; 'Poetical Addresses to His Majesty,' 1788, 4to.; 'Letter to the King on the Conduct of Colonel Lennox,' 1789, 4to. His remarks in this letter gave offence to Colonel Lennox, and a duel was the consequence, in which Swift received a pistol wound.

Theophilus Swift wrote an 'Essay on the Rise and Progress of Rhyme,' which was printed in the 'Transactions' of the Irish Academy, vol. ix., 1801. Scott's edition of Swift's Works contains several communications from Theophilus Swift. He died in Ireland in the summer of 1815.

SWIMMING. This is an art which is easily acquired, though something depends upon the natural buoyancy of the individual's body, in which respect there are sometimes great differences. The best place for learning to swim is in deep water. It is always to be borne in mind by the learner, that the stroke which is to sustain and propel him must be compound, that is, the action of legs and arms simultaneously. This stroke must not be made on the surface of the water, nor must the individual kick up his heels in the air behind him; the sweep of the arms and spurn of the legs must always be made under the water, and rather deeply so with the legs. The back should be kept hollow, slanting, and steady, never rising with the stroke, except as the whole body rises. The hands must on all occasions be kept in the shape of a cup or scoop, and the same closeness and hollowness should be preserved in the toes and shape of the feet. In making the stroke the palms of the hands are placed together and pushed straight forwards, like the keel of a boat's bows, about an inch under the water; at the same moment the knees are drawn up beneath the body and widely. The next motion is that of the hands, shaped like a scoop, with the thumb downwards, and sweeping back the water in such a manner as to bring the whole of the arms into action from the shoulders to the hands; at the same moment the legs are thrown back, and the feet vigorously pushed against the water beneath. The hands are to be swept out as far as possible, and the effort to be relaxed only when both hands have been swept as far beyond a horizontal extension as can be effected without straining the shoulders and bladebones. This motion of the arms and hands having been made, the action is instantly relaxed, the arms are bent, with the elbows drawn back till the ball of the thumb of each hand gently touches the ribs on both sides; and the hands being then again brought palm to palm together, are sent forward in a direct line (the tips of the two thumbs passing exactly under the centre of the chin), to repeat the stroke. In like manner the motion of the legs and feet having been made, the action is instantly relaxed, and the legs are extended out straight, with the toes pointing gently downwards, till the knees are again drawn up to repeat the stroke. The learner should understand that the principal propelling power is in the legs; the arms and hands he should chiefly consider as the means of sustaining his head above the surface. The use of corks, bladders, or life-preservers, is certain to retard the learner's confidence in the natural buoyancy of his body in the water. They are moreover dangerous; for they may slip from their fastenings at the shoulders or round the waist, and entangle themselves round the feet. Entire confidence in the water is of course only to be obtained by acquiring such a proficiency in swimming as shall induce the feeling of a mastery over the element: a considerable degree of confidence however may be acquired from repeating a very simple experiment. Choose a spot for bathing where the bank is gently sloping, and wade in it till the water is breast-high. It is of no use unless the water is at least breast-high. Then turn round and face the shore or bank, and as the learner will thus be aware that his efforts are tending in a safe direction, he may plunge forwards and downwards without fear.

The method of teaching swimming which was first introduced in the swimming-schools of Prussia by General Pfuel, is, in all respects, excellent. The teacher stands on a platform on the edge of the water (the level borders of a river would be just as good) behind a strong oak rail, running horizontally to the extent of 20 or 30 feet, and about 4 feet high from the level of the platform or bank. The teacher holds a staff of about 9 feet in length, to the top of which a rope is attached, which descends towards the water and is inserted in the ring of a belt, which belt is fixed under the arms of the learner, who lies along the water. The wooden rail thus becomes the fulcrum, and the staff a lever. It is managed with ease by one hand of the teacher, as the staff rests upon the rail, and also has the other end upon the ground. The learner is supported by the rope, which rises from the ring between his shoulders. He is there carefully instructed in the various movements, singly at first, and is made to repeat them until they are quite familiar to him. When the learner begins to be able to support himself, the teacher raises the lower part of his staff (*resting against* the rail), which thus lowers the top, and therefore slackens the rope; but

instantly brings the staff into a more perpendicular position if he sees the pupil sinking. When he can swim ten strokes in succession, the staff is abandoned, and the master only holds the rope; when he can swim forty or fifty strokes, the rope is taken away, but the teacher always keeps near enough to reach him with a long pole. The pupil is not considered safe until he is able to swim for half an hour without resting or receiving assistance.

Turning in the water, swimming on the back, and floating, are of comparatively easy acquirement when the learner has mastered the elements of the art. Until these are achieved, and he can swim well in the ordinary way, the learner should avoid the practice of all ingenious antics and manœuvres. Never leap or plunge from a height without having first accomplished it by degrees of a foot at a time. Never remain long in the water upon an empty stomach, nor enter immediately after a full meal. Never enter the water in a state of perspiration, nor when very cold. If subject to the cramp, never bathe out of the reach of assistance. On rising after being immersed, breathe first out from the nostrils (to expel the water) before taking in the breath at the mouth. Avoid water which contains cold springs or beds of weeds. If ever you attempt to save the life of a drowning person, be careful not to let him lay hold of you. Take a stick if you can, and present one end to him. If you have no stick, approach him very cautiously from behind, and wait till you can firmly seize him with your left hand by the upper part of his right arm, and then keep at arm's length. If you cannot manage him your own way, dive and make your escape, or both will be lost.

SWINBURNE, HENRY, was born in May, 1752. He was the third son of Sir John Swinburne, Bart., of Capheaton, in Northumberland, of an ancient Roman Catholic family. He received his education at the monastic seminary of Lacelle, in France. By the death of his eldest brother, he became possessed of an annuity and of a small estate at Hamsterley, in the county of Durham, and was thus placed in independent circumstances. He now commenced travelling, and continued, with the exception of occasional visits to England, to reside in various parts of the Continent for some years, occupied principally in the study of literature and the arts. Having lost some West India property, which had been devastated during the war, he obtained through the favour of Marie Antoinette a grant of land in the island of St. Vincent, the value of which was however much reduced on the cession of that island to Great Britain.

After having long solicited a diplomatic appointment from the British government, he was appointed, in 1796, commissioner for the adjustment of the cartel then proposed for the exchange of prisoners-of-war between France and England. In the performance of this service great difficulties occurred from the refusal of the French to give up Sir Sidney Smith; and, after long and fruitless negociations, Swinburne was recalled at the close of the year 1797. His latter years were saddened by the loss of his son, who was shipwrecked on his way to Jamaica, and by the diminution of his fortune, which induced him, in 1801, to accept the offices of vendue master in the island of Trinidad, and commissioner for the restoration of the Danish islands. After a few months' residence at Trinidad, Swinburne fell a victim to the climate, April 1, 1803.

His works are—'Travels through Spain in the Years 1775 and 1776,' London, 8vo., in a series of letters; 'Travels in the Two Sicilies in the Years 1777, 1778, 1779, and 1780;' and a Correspondence extending from the year 1774 to that of his death, edited by Charles White, Esq., under the title of the 'Courts of Europe at the close of the Last Century,' 2 vols. 8vo., London, 1841. Swinburne is a lively and sensible writer, and was an attentive observer of national characteristics.

SWINDON. [WILTSHIRE.]

SWINE. [HOG.]

SWINEMÜNDE. [STETTIN.]

SWINESHEAD. [LINCOLNSHIRE.]

SWITHIN, ST., seventeenth bishop of Winchester, was born in the early part of the ninth century. He was ordained priest in 830 by Helmstan, bishop of Winchester, and was chaplain to King Egbert, and tutor to his son Ethelwulf. In the reign of the latter he became chancellor, and was intrusted with the education of Alfred, whom he accompanied to Rome. The services rendered by Swithin were rewarded by his elevation in 852 to the see of Winchester. He is supposed to have procured the first act of the Wittenagemot for enforcing the universal payment of tithes. St. Swithin died July 2, 862. His last request was that he should be buried in the churchyard of Winchester, but within a century afterwards, his name having been admitted into the calendar as that of a canonised saint, it was resolved to transfer his remains to the cathedral, and to place them in a magnificent shrine which had been prepared for the purpose by King Egbert. The translation, which was to have taken place on the 15th of July, was delayed for forty days in consequence of the rainy weather which occurred, and hence arose the well-known tradition that if it rains on St. Swithin's-day, it will rain for forty days successively; or if it be fair, it will continue fair for forty days.

The festival of St. Swithin in the Roman Martyrology is July 2, the day of his death, but in England it was celebrated on July 15, the day appointed for the translation of his relics to the cathedral of Winchester.

SWITZERLAND (*Schweitz, La Suisse*), a country of Europe situated between 45° 48′ and 47° 49′ N. lat., 5° 55′ and 10° 30′ E. long., is bounded N. by Bavaria, Würtemberg, and Baden, from which it is separated by the lake of Constanz and by the Rhine, except in three or four places, where the canton of Schaffhausen and a part of that of Zürich extend to the right bank of the river; E. by the Tyrol; S. by Austrian Italy and the Sardinian States; and W. by France. It extends a little more than 180 miles near 46° 30′ N. lat., from W. to E., with a width of about 130 miles

at 9° E. long.; between the head of the Val Formazza and Lichtenstein in the Tyrol the width is not much over 60 miles. The area is 15,201 square miles, and the population, according to the census of 1850, was 2,365,286. The surface of Switzerland presents a greater variety than most countries of Europe. The greater part of the country is mountainous. The ranges of the Alps and their numerous offsets extend over the southern and south-eastern districts, and occupy about one-half of Switzerland. Along its western boundary run the ridges of the Jura Mountains. The country between these two mountain-systems has, towards the south, the form of a plain, interspersed with isolated hills; and towards the north it is traversed by ridges or groups of hills of moderate elevation. Thus Switzerland is naturally divided into four regions: the Alps, the Plain, the Hilly Country, and the Jura Mountains.

The *Region of the Alps* is divided from the Plain and Hilly Country by an irregular line which starts from the lake of Geneva at Vevay, and running over Mont Molesson, the northern extremity of lake Thun, Mont Napf, the northern extremity of the lake of Luzern, the most southern part of the lake of Zürich, and the lake of Wallenstadt, terminates near Sargans on the left bank of the Rhine. The whole country S. and E. of this line is occupied by the mountain-masses and chains of the Alps, and only a small portion of it is cultivable; a larger portion, which is on the upper slopes of the mountains, is available as pasture ground.

The natural division of the Alps of Switzerland is formed by the immense mountain-knot which is on the west of the mountain-pass of the Saint Gothard, and surrounds the sources of the Rhône. A space exceeding 100 square miles rises above the snow-line, and is overtopped by numerous summits, rising from 10,000 to 12,000 feet above the sea. The most remarkable of these summits are the Gallenstock, the Gletscherhorn, the Diechtenhorn, the Triftenstock, the Süstenhorn, and the Spitzliberg. From this mountain-knot a chain runs N. to the narrow channel which connects the lakes of Uri and Luzern. This chain contains several lofty summits, among which is the Titlis, 11,406 feet high, and the Urner Rothstock, 10,065 feet high. The chain which extends southward from the mountain-knot between Val Formazza on the west, and Valle Maggia on the east, contains summits between 6000 and 7000 feet high. From the western edge of the mountain-knot issue two ranges, of which the northern, called the Bernese Alps, runs W. by S.; and the southern, called the Lepontian Alps, runs S.W. Two other ranges branch off from the east side of the mountain-knot. One which runs nearly E. is called the Rhætian Alps, and near 9° 50′ E. long., divides into two ranges, of which the northern is called the Septimer Alps, and the southern the Bernina Alps. These two secondary ranges run N.E. and extend into the Tyrol. The other range has received the name of the Range of the Dödi, from its highest summit. It runs north-east, and terminates near the banks of the Rhine about 47° N. lat. These mountain-regions and the valleys enclosed between them differ considerably in their productive powers.

The Valais is enclosed by the Lepontian and Pennine Alps on the south, and the Bernese Alps on the north. The southern range runs S.S.W. from the great mountain-knot as far as the pass of the Simplon, and so far it bears the name of the Lepontian Alps. Its mean elevation is about 7500 feet, but several summits attain 10,000 feet. The width of the mountain-masses in general does not exceed 10 miles, for that is about the general distance between the inhabited places in Valais and the Val Formazza. There are several glaciers, but none of them of great extent. Some of them descend to the vicinity of the Simplon Pass, over which the great road leads from Switzerland to Italy.

West of the Simplon are the Pennine Alps, which extend nearly due S., about 20 miles, to Monte Rosa, whence they run W. to the northern part of Mont Blanc. The general elevation approaches to the height of 10,000 feet, and the higher part of this range, with the exception of the passes, is covered with snow all the year round. On the eastern edge of this tract are the summits of Monte Parabranco, Cima de Jazzi (13,840 feet high), and Monte Rosa (15,158 feet); on its southern edge, the summits of Cervin (14,764 feet), Combin (14,126 feet), Velan (11,043 feet), and several others. Towards the east and south the mountains descend with a rapid declivity, and the valleys on that side in Piedmont are inhabited to the vicinity of the most elevated mass. But on the north the high masses extend many miles without falling below the snow-line, and terminate about 6 miles from the Rhône. A tract between the Simplon on the east and Mont Combin on the west, measuring 30 miles in length and 15 in breadth, is covered with snow, ice, and glaciers. These masses extend therefore over a surface of about 450 square miles, and this whole tract contains only two valleys, Saas and S. Nicolai, which are inhabited. Between Mont Combin and the masses of Mont Blanc, the snow-covered portion of the range occupies a comparatively small area.

The valley of the Rhône lies N. of the mountain-region just described, and is about 92 miles long. Its eastern portion, as far down as Briegg, varies between a quarter and half a mile in width. Below the confluence of the Rhône with the Visp, the valley is from one to two miles wide, and in a few places the width is greater. Besides the valley of the Visp, the branches of which are inhabited to the distance of 18 miles from the river, several lateral valleys open into that of the Rhône, which are from a quarter to half a mile wide, and inhabited to the extent of six miles from the banks of the river. But between Sion and Martigny the mountain-masses approach the river, and the inhabited tract is not more than two or three miles wide. Below the great bend, the rocky masses of the Dent de Morcles on the east, and of the Dent du Midi on the west, approach so near to the river, that in several places there is hardly room enough for a road along the banks. About eight miles from the Lake of Geneva, the tract along the banks is two miles wide, low and swampy. The descent of the valley amounts to 3720 feet. Above Briegg the corn remains in the fields till the beginning of

October, and it is reaped W. of Sion in the month of June. Only the common grains and roots are cultivated above Briegg, and some fruit-trees do not grow: the lower districts produce maize; and the vine, almond, and fig-tree flourish.

On the northern side of the valley of the Rhône are the Bernese Alps. Their eastern extremity is formed by a ridge called the Grimsel, over which a mule-road leads from the valley of Hasli to that of the Rhône. The highest part of this road is 8300 feet above the level of the sea. To the west of the Grimsel and the valley of Hasli begins the largest continuous mass of ice and snow on the Alps. It extends on both sides of the highest edge of the range from E. to W., a distance of 30 miles long in a straight line, and from N. to S. about 20, occupying nearly the whole of the country between the lakes of Brienz and Thun and the valley of the Rhône. The outer edges of this region only are indented by three short valleys, which are inhabited—the valley of Lötsch, which opens into the valley of the Rhône, and of Grindewald and Lauterbrunnen, which open into the valley of the Aar. From this immense lake of ice rise numerous summits, chiefly in the form of pyramids—the Finsteraarhorn (14,107 feet), the Mönch (13,502 feet), the Jungfrau (13,621 feet), the Breithorn (12,462 feet), the Altels (12,172 feet), the Rinderhorn (11,683 feet) and the Wildstrubel (10,980 feet); and N. of this series the Eiger (12,992 feet), the Shreckhorn (13,444 feet), the Wetterhorn (12,220 feet), the Blumlis Alp (12,145 feet), and the Dolderhorn (11,920 feet). The Faulhorn, not far from the lake of Brienz, rises to only 8750 feet, but is frequently ascended by travellers, on account of the magnificent view which it offers of the numerous mountains and glaciers which lie S. of it.

The valley of the Kander separates this region from that which lies farther west, and in which the Alps rise above the snow-line only in a few places. The highest part of the mountains continues to run S.W. as far as the three-headed summit, called Diablerets, or Teufelshörner (10,447 feet), where the chain divides into two branches, one of which runs S.S.W. and terminates on the banks of the Rhône, near the Dent des Morcles (9567 feet), and the other extends westwards to Mont Molesson (6577 feet). The glaciers in these two chains are of comparatively small extent.

The country which extends north of this range, between the rivers Kander and Saane, and the lake of Thun, is mountainous: but few of the summits are always covered with snow. The form of these mountains differs from that of the higher Alps, their summits being rounded and rather flat at the top: the declivities are less steep than those of the higher mountains. The lower declivities are covered with fine grass, which supplies excellent pasture during the summer months, and in many places with trees. The highest and most continuous ridge of mountains in this country is that which extends to the west of the valley of the Kander, and terminates in Mont Niesen (7824 feet). Among the isolated summits is the Stockhorn (7213 feet) W. of the lake of Thun.

The valley of Hasli lies between the largest fields of ice and snow, and extends in the form of a semicircle more than 20 miles to the influx of the Aar into the lake of Brienz. The lower part of the valley is partly cultivated and partly meadow-ground. There are extensive plantations of walnut-trees. The mountain-slopes that enclose it supply fine pastures. The low and level tract which lies between the lakes of Brienz and Thun is fertile, and has vineyards and extensive plantations of walnut-trees. The climate is so temperate that the flowers blossom in the month of February.

The country between the Aar and the lake of Luzern is much less mountainous and broken than the region S. of the lake of Thun. The most elevated tract is north of the lake of Brienz, where the Rothhorn attains 7536 feet above the sea, the Tannhorn 6962 feet, the Hohgant 7852 feet, Mont Pilatus 6904 feet, and Mont Napf, the north-western point of this region, 5277 feet. The surface of this country is a succession of ascents and descents, with very small tracts of level ground between them. Nearly the whole of the country is pasture-ground, except in the vicinity of the lake of Luzern, where large tracts are planted with walnut and chestnut trees.

Along the eastern edge of the mountain-knot, W. of the St. Gothard, lies the valley of the Upper Reuss, the upper part of which is extremely cold, being in its lowest part 4644 feet above the sea-level; the lowest part, or the valley of Uri, has a very temperate climate, being only about 1500 feet above the sea. The upper valley has an 8 months' winter, and produces nothing but pasture. The valley of Uri produces maize and other grain, and also peaches and chestnuts. The highest part of the St. Gothard road, which runs up this valley, is about 7100 feet above the sea.

The country between the valley of the Reuss and the lake of Luzern, the lake of Wallenstadt, and the valley of the Upper Rhine, is the most broken portion of the mountain-region of the Alps in Switzerland. The valleys are extremely narrow, and the declivity of the mountains is exceedingly broken, and so steep that large tracts on the mountains' sides are bare of trees and bushes, and only a very small surface is fit for pasture. The mountains, though connected with one another by ridges, are scattered over the surface in the greatest disorder, except along the valley of the Rhine, where they form a tolerably contiguous range. This range, called the range of the Dödi, is connected with the mountains that line the valley of the Aar on the E., and thence runs E.N.E. over the Krispalt, the Oberalpenstock (10,873 feet), the Dödi (11,811 feet), the Kistenberg (11,068 feet), the Scheibe (10,000 feet), and the Graue Hörner (9338 feet), terminating near the Rhine in precipitous masses of rock. The glaciers on this chain are numerous, but with the exception of those which surround the Dödi and Kistenberg, they are not of great extent. In the country N. of this range there is also a considerable number of single mountains, which rise above the snow-line, as the Windgellen (10,336 feet), the Scheerhorn (10,809 feet), the

Claridden Alps (10,489), Hoch Glärnisch (9509 feet), and several others. But as these mountains are isolated, the glaciers are of small extent. In proceeding N.W. the mountains decrease in elevation, and their declivities are much more gentle. North-west of a line drawn from the lake of Uri to that of Wallenstadt, there are only a few summits above the region of trees. The declivities are generally accessible to cattle, and supply pasture-ground, but few places are cultivated. There are however some plantations of vines, peach, and other fruit-trees. The narrow valleys of this tract have a temperate climate, and the winters last only two or three months.

The valley of the Upper Rhine extends in a north-east direction for about 45 miles from the source of the river to Coir, and thence for about the same distance to the influx of the Rhine into the lake of Constanz. That portion of the valley which lies above Trons is not cultivated owing to the rigour of the climate: the winter lasts 8 or 9 months. At Trons agriculture begins, but on a very moderate scale, as part of the basin is covered with swamps. The lower part of the valley which begins at Chur or Coir is divided into two parts by two mountains, which come close up to the river near 47° 5′ N. lat. The southern part, which descends gradually from about 1755 to 1600 feet, is about 15 miles long, and varies in width from 2 to 3 miles: the whole of it is under cultivation, and it produces maize, wheat, and other grains; and near the base of the adjacent mountains there are vines and fruit trees. The northern portion, called the Rheinthal, is about 30 miles long, and from 3 to 6 wide; but only the smaller part of it, which extends along the left bank of the river, belongs to Switzerland. It is one of the best-cultivated tracts in Switzerland, and produces large quantities of maize and other grains. The vine and fruit-trees are abundant. Great quantities of cider are made.

The principal range of the Rhætian Alps branches off to the east of the St. Gothard. A continuous range of mountains extends 20 miles, to Piz Valrein, which attains an elevation of 10,960 feet, and is surrounded by extensive glaciers, the source of the Hinter-Rhein. Not far from it is the Muschelhorn (10,234 feet); and between the roads leading over the St. Bernhardin and the Splügen is the Tambohorn (10,436 feet). The range continues E. to the source of the Inn, where it turns N.N.E. along the eastern frontier of Switzerland, and enters the Tyrol. This last portion of the range is very high, and the snow along the crest is almost continuous. Some of the glaciers are extensive; one, which surrounds Mont Fermund (12,000 feet), is said to cover nearly 100 square miles. From this immense field of ice and snow the Rhäticon range branches off N.W., and terminates on the Rhine, in the Fascherberg, N. of Meyenfeld. The crest of this mountain-wall, which is about 10 miles wide and 30 miles long, is generally above the snow-line, and glaciers descend its sides. The most elevated summit, the Scesa Plana, is 9818 feet above the sea-level. The Rhäticon divides Switzerland from the Vorarlberg.

The country between the ranges just described and the valley of the Upper Rhine extends more than 40 miles in length, and about 24 in width: it is filled with extensive mountain-masses, connected with the principal range by lower ridges, which sometimes constitute ranges several miles long, rising above the snow-line and covered with glaciers. The valleys which lie between these mountain-masses are very numerous, but they rarely exceed half a mile in width. Most of them however have excellent pasture-grounds, and the level tracts are converted into artificial meadows, which are irrigated; potatoes and vegetables are the only crops raised. The valley of the Hinter-Rhein is the longest; the roads between Coir and Italy by the Splügen and Bernhardin pass through it.

The southern chain of the Rhætian Alps, called the Bernina range, runs parallel to the principal range: its southern extremity extends into Lombardy, and the northern into the Tyrol. It appears to be as high as the principal range, for a great part of the most elevated ridges is always covered with snow, and contains numerous glaciers. The most elevated summit is said to be that called Monte dell' Oro, which stands within the Austrian dominions. Between the Bernina range and the principal range of the Rhætian Alps the pastoral valley of Engadin is enclosed. [ENGADIN.] On the southern declivity of the Bernina range two valleys belong to Switzerland: the valley of Münster, which opens into the valley of the Adige; and the valley of Poschiavo, which is 15 miles long and opens into the valley of the Adda.

Numerous rivers rise on the southern declivities of the Rhætian Alps, and flow S. into the Ticino. The country drained by them is traversed by several mountain-ranges, which run southward and occupy the greater part of its area. Between the ranges there are several fertile valleys of considerable extent: the largest are those of Misocco, Leventina, and Maggia. In the upper parts of the valleys, the inhabitants live on the produce of their herds; in the middle parts, maize and other kinds of grain are grown, and vines, chestnuts, walnuts, and other fruits, abound; the lower parts have plantations of fig and mulberry trees. No other part of Switzerland contains such extensive forests and such fine trees. The river-floods are often very destructive in these valleys.

Small lakes are very numerous among the Alps. A few of them occur in the basins of the valleys, but the greater number lie in the mountains, being enclosed by high walls of rocks. Some of them are at such an elevation as to be covered with ice all the year round. All Alpine lakes are deep; in some cases the depth is 100 fathoms. They contain few fish.

The *Hilly Region* extends over the north-eastern portion of Switzerland. It is separated from the rest of Switzerland by the Aar to its junction with the Reuss, then by the Reuss and its feeder the Lorze, and lake Zug; thence by a line running along the southern shore of the lake of Zürich and the depression in which the Wallenstadt Lake lies, to the Rhine near Sargans. The Rhine and the Bodensee form almost all the

rest of the boundary. The level tract which separates the lakes of Zürich and Wallenstadt, and that which extends from them to the Rhine, are hardly more than 20 feet above the waters.

That part of the country E. of a line joining the western extremity of the Wallenstadt Lake with the point where the Rhine enters the Bodensee, is mountainous. North of the depression, between Sargans and the Wallenstadt Lake, the country rises with a steep ascent to between 3000 and 4000 feet high, and on the northern shores of lake Wallenstadt it attains an elevation of 7000 feet above the sea-level. This continuous range, which descends towards the lake with a steep declivity, is called the Kuhfirsten, and terminates on the west in the elevated summit of Mont Speer (6636 feet). Its northern declivity is comparatively gentle. North of the eastern extremity of the lake of Wallenstadt, a lower ridge, called the Grabser Alpen, branches off towards the north and connects the Kuhfirsten with the mountain-group called the Alpstein, which from E. to W. extends about 10 miles, while its lower offsets advance to the very shores of the lake of Constanz. Towards its southern border are the highest summits, of which the Säntis attains an elevation of 8272 feet, and has a small glacier on its northern declivity. To the northward several other summits rise from 4000 to 6000 feet, but at the distance of 6 miles from the lake of Constanz they sink down to 4000 feet, and gradually decrease in height. This tract has pretty wide valleys; and as the mountains have less rapid slopes than in other parts of the Alps, the pasture-grounds on the upper declivities are more extensive. Very little grain is cultivated, but there are some fruit-trees and vines.

The remainder of the hilly region presents a succession of high swells with moderately gentle declivities and rounded or flat tops. None of these high hills exceed 4000 feet above the sea, nor about 1800 feet above their base. Between the lakes of Luzern and Zug stands the isolated summit of Righi, which is 5916 feet high. The surface between the lake of Constanz and the Thur is comparatively level. This is considered to be the most fertile tract in all Switzerland, especially that part between Arbon on the banks of the lake, and Stein on the Rhine, which presents a succession of cultivated fields, orchards, vineyards, and artificial meadows. The soil of the remainder of this region is less fertile, though in general it is above mediocrity and well cultivated. The country along the north bank of the lake of Zürich is very little inferior to the tract along the lake of Constanz.

The *lake of Wallenstadt*, the *Lacus Riparius* of the ancients, is 10 miles long, and about 2 wide. It is very deep, in most places from 60 to 80 fathoms. Its shores are extremely steep, rocky, and high, with the high ranges of the Kuhfirsten on the north, and the Mörtschenstock on the south: at the two extremities it is bordered by low tracts. The surface is 1424 feet above the sea-level. The *lake of Zürich* is about 24 miles long; its mean width less than 3; the surface is 1310 feet above the sea-level. Near its eastern extremity is a level tract of some extent, but, with this exception, the shores are surrounded by gently-sloping hills, covered with vineyards, orchards, and cultivated fields. In a few places it is stated to be 100 fathoms deep. The largest rivers of this region are—the *Thur*, which rises at the foot of Mont Säntis, and flowing W. enters the Rhine above Eglisau; and the *Limmat*, which originates, under the name of the Linth, on the northern declivity of Mont Dödi, and traverses a very narrow valley until it meets the lake of Wallenstadt. It did not originally run into the lake, but has been made to do so by a canal; and another (the Linth) canal conveys the water from the lake of Wallenstadt to that of Zürich. This change in the course of the river was made in order to save the low country near the lakes from the ravages of the sudden inundations to which the river is subject. The river issuing from the western extremity of the lake of Zürich is called the Limmat. It falls into the Aar a little below the junction of the Reuss. The Limmat is navigated, but it can be ascended by unladen boats only, on account of the rapidity of the current.

The *Plain* of Switzerland, which lies between the mountain-region, the hilly-region, and the Jura Mountains, extends N.E. from the lake of Geneva to the lower course of the Reuss from Roth to its confluence with the Aar. The western boundary of this region is formed by the Aar, the lakes of Bienne and Neuchâtel, and a straight line from Yverdun on the south shore of the latter, to Rolle on the western shore of the lake of Geneva. This plain is properly an immense valley, surrounded by mountains, and extending more than 100 miles in length, with a width between 20 and 30 miles.

On the southern and western borders of the plain are four considerable lakes: the lakes of Geneva, Morat, Neuchâtel, and Bienne, which are at elevations of 1228, 1450, 1429, and 1410 feet respectively above the sea-level. The watershed between the lakes of Geneva and Neuchâtel is never more than 2 miles from the former, and nearly the whole drainage runs to the lakes of Neuchâtel and Morat, though their surface is so much higher. This is effected by a high swell, called Mont Jorat, which extends westward, close to the shore of the lake of Geneva, as far as Ouchy, W. of Lausanne, where it recedes from the lake and runs N.W. towards the Jura Mountains; but it does not reach them, being divided from them by a narrow swampy depression near the small town of Lasarras. From these swamps, the Noson runs N. and joins the Orbe, which falls into the lake of Neuchâtel; whilst the Veiron flows S. to the lake of Geneva. The whole country between the lakes of Geneva and Neuchâtel, with the exception of the steep descent of the Jorat range towards the lake of Geneva, presents a succession of round-backed hills or short ranges, sloping very gradually on all sides, and interspersed with open valleys. The whole country is covered either with corn-fields, on which maize, wheat, barley, &c., are grown, or with orchards or vineyards. Plantations of chest-

nut-trees are extensive, and almond and fig-trees abound.

Another swell of high ground, connected with Mont Jorat, extends from Moudon to the town of Freyburg; thence it runs to the southward of the town of Bern, where it declines more to the east, and terminates in Mont Napf. This swell rises generally about 1000 feet above its base, which may be 1500 feet above the sea. On the spacious and level summit, and the gentle declivities of this swell, pastures and cultivated fields succeed one another, with orchards and vineyards. The beautiful and rich valley of the Emmen extends as far north as the town of Burgdorf.

The remainder of the plain has generally an undulating surface, the eminences rarely rising into hills, and most of the slopes being gentle. There occur also some level tracts, the largest of which is the low country between the lakes of Neuchâtel, Morat, and Bienne, and which, when the rains have been very abundant, is overflowed. The soil is of moderate fertility; it is mostly under the plough, and produces all kinds of grain, as well as hemp and flax. Vineyards are not extensive; but apples, pears, plums, walnuts, and cherries, of which kirschwasser is made, are very abundant. At the north-eastern extremity of this country is the Lindenberg, a moderate swell, about 500 feet above its base, which is remarkable for the horizontal line in which its crest runs for 20 miles, between Roth and Lenzburg: not an eminence is observed on it.

The principal river of the plain is the AAR, which here receives the Saane, Thiele or Ziel, Emmen, and Reuss. None of these affluents of the Aar are navigable, except the Thiele, which is navigated by river-barges and steam-boats to the lakes of Bienne and Neuchâtel. The lakes of Geneva [LEMAN, LAKE], NEUCHATEL, Morat [FREYBURG], and BIENNE, have been already noticed. These lakes abound in fish. In the north-eastern districts of the plain are several smaller lakes. The *lake of Sempach*, which is about 5 miles long, and one broad, is 1695 feet above the sea-level.

The region of the *Jura Mountains* occupies the west part of the country, and extends along the boundary of France for about 150 miles in length, with a width of about 30 miles. It begins on the banks of the Rhône at the place called Perte-du-Rhône, where the river runs underground, and extends to the banks of the Aar and the Rhine. About half of this region lies within France. In Switzerland it extends over the western districts of Vaud, the whole of Neuchâtel, the north-western districts of Bern, the greater part of Solothurn and Basel, and a small portion of Aargau. It rises from the plain of Switzerland with a steep ascent to the height of 3000 feet, and at this elevation it is traversed in its length by many low chains, which divide the whole surface of the region into numerous longitudinal valleys. Many of these valleys are connected with one another by depressions, while others are entirely surrounded by hills, and the water which collects in them escapes by natural tunnels. On the low and narrow ridges which divide these valleys, a few summits rise from 600 to 2000 feet above their base. The southern part of the table-land, which is entirely within France, is the most elevated. [JURA MOUNTAINS.] Within Switzerland are Mont Dole (5515 feet), and Mont Tendre (5522 feet), which lie W. and N.W. of the lake of Geneva, and Mont Chasseron (5223 feet), W. of the lake of Neuchâtel, and Mont Chasseral (5211 feet), N.W. of the lake of Bienne.

The southern part of this region forms a part of the canton of Vaud. Here the Jura Mountains do not rise abruptly from the plain, but a lower range, of small width, called La Côte, lies between them, which between Geneva and Morges is covered with vineyards. Farther N. are plantations of mulberry-trees. There are also numerous orchards, and in some parts the slopes are wooded. In the mountain-region itself there are two large and several smaller valleys. The two larger valleys are those of Joux and Valorbe. The valley of Joux, S. of the Dent-de-Vaulion summit (4831 feet), is 3375 feet above the level of the sea. It is drained by the Orbe, which in approaching the Dent-de-Vaulion enters the small lake of Joux. After leaving this lake the river forms the lake of Brenet, on flowing from which it is precipitated into an opening at the foot of the Dent-de-Vaulion, from which it issues as a considerable stream on the north side of the mountain. Here begins the Valorbe, which extends to the town of Orbe, where the river, leaving the mountains, flows through the plain to its mouth, in the lake of Neuchâtel. In the valley of Joux, only barley and oats are grown; the greater part of it is used as pasture and meadow ground. The Valorbe contains fine forest trees, and is generally well cultivated; the hill-slopes produce grass: all kinds of fruit-trees abound.

The central district of the Jura Mountains extends from the southern extremity of the lake of Neuchâtel to the northern extremity of the lake of Bienne. It consists of numerous valleys, which are divided from one another by low ridges. The whole region is destitute of trees, with the exception of the lower portion of the eastern slope, where there are extensive vineyards and orchards. There are also mulberry-trees, and some silk is produced. Here also, and in three large valleys which open towards the lakes, every kind of grain is grown, and agriculture is carried to a high degree of perfection. But the mountain-region itself produces only pasture, which is rich however and maintains large herds of cattle. The inhabitants of this district, as well as of the southern, are noted for their great manufacturing industry. In spite of the long winter, which lasts seven months, these districts are among the most populous in Europe, though every article of food is very dear, owing to the difficulty of transporting it from the lower country. Within the region nothing is cultivated except barley and oats, and these only to a small extent.

North of the lake of Bienne, the steep declivity of the Jura range continues along the banks of the Aar to its confluence with the Rhine, a distance of 60 miles, in which it is only once interrupted by a valley. It rises more than 1000 feet above its base, and has some summits, of which

the Weissenstein, N.W. of Solothurn (4616 feet), is perhaps the highest. As far as this mountain the valleys extend longitudinally in the direction of the whole system, and are partly covered with wood. North of the Weissenstein the country slopes to the north, and the numerous valleys with which it is furrowed are transverse valleys. These valleys sink much lower than those of the central district; they have the advantage of a more fruitful soil, and a much more moderate climate; the lower and level grounds produce all kinds of grain; the hill-slopes produce good pasture. The orchards also are very extensive.

Climate.—The climate of Switzerland presents great differences, which are almost entirely the effect of the greater or less elevation above the sea-level. Some regions rise above the line of perpetual congelation, and some of the inhabited valleys to 4000 feet above the level of the sea. On the St. Gothard, Bernardhin, and Splügen, there are human dwellings at an elevation of between 6000 and 7000 feet. On the other hand, the surface of the plain is only between 1300 and 1400 feet above the sea-level: some parts of the hilly region are less than 1000 feet high, the Rhine at Basel sinks to 800 feet, and the surface of the Lago Maggiore even to 678 feet. The climate of the lower districts is more temperate than that of most countries of Germany, and the valleys S. of the Alps have a climate like that of Lombardy. At Bern the mean temperature of every season is lower than at London, and so it is also at Zürich, with the exception of the summer, which is higher by about 2½ degrees. At Geneva the spring and summer are hotter than at London, but the autumn and winter are colder. The mean annual temperature is 49.50° for Geneva, 47.95° for Zürich, 45.12° for Bern, 30.10° for the Hospice of St. Gothard, and 50.50° for London. The quantity of rain that falls annually on the southern declivity of the Alps amounts to 57.83 inches, whilst on the western side it is only 47.17 inches, and on the northern not more than 36.13: the number of rainy days in the year for these same districts respectively is 148, 100, 159. In some parts a great quantity of snow falls, especially on the Jura Mountains, where it often accumulates to a depth of 30 feet.

Divisions.—The Swiss confederation consists of 22 cantons, which, with their area and population, are as follows:—

Cantons.	Area in sq. miles.	Population.
Zürich	684.1	250,388
Bern	2556.7	440,967
Luzern	586.3	134,610
Uri	422.0	14,614
Schwyz	337.7	43,943
Unterwalden	262.4	24,400
Glaris	279.3	31,726
Zug	85.3	16,563
Freyburg	562.9	98,529
Solothurn	254.1	68,316
Basel	184.3	70,725
Schaffhausen	115.5	33,647
Appenzell	152.6	54,998
St.-Gall	752.7	171,723
Grisons	2962.4	91,353
Aargau	501.5	197,562
Thurgau	268.9	90,940
Tessin (Ticino)	1032.8	123,153
Vaud	1179.7	198,456
Valais	1658.5	81,939
Neuchâtel	279.7	63,365
Geneva	81.2	63,419
Total	15,200.6	2,365,286

Of the population of Switzerland, about three-fourths speak dialects of German. French is generally spoken in the western cantons. The inhabitants of Ticino and of some valleys of the Grisons, on the south side of the Alps, speak a dialect of the Italian; and one-half of the population of the Grisons speak the Romuntch and Ladin, which are peculiar dialects, apparently of Latin origin.

With regard to religion, about five-eighths of the population of Switzerland are Protestants of various sects—Calvinists, Lutherans, Methodists, Evangelicals, &c. The Rationalistic views of the Germans have spread considerably of late years. The rest of the population, numbering about 900,000, is Catholic. The cantons of Luzern, Zug, Schwyz, Uri, Unterwalden, Valais, and Ticino are exclusively Catholic; in the other cantons the population is mixed, but all classes enjoy liberty of conscience.

Natural Productions.—Two-thirds of Switzerland do not produce corn enough for the consumption: this is particularly the case in the central and eastern cantons which lie in the highlands of the Alps. The cantons which produce most corn are Soleure, Bern, Freyburg, Aargau, Schaffhausen, Luzern, and Vaud. Potatoes are much cultivated in the highlands. Flax and hemp are also extensively grown; but the chief territorial wealth of the highlands, and indeed of the greater part of Switzerland, consists in its pastures and its cattle. The sheep are mostly of inferior breed, and the wool is short and coarse. Goats are very numerous in the highlands; pigs are plentiful and fine.

The vine is extensively cultivated in the cantons of Vaud, Geneva, Neuchâtel, Zürich, Schaffhausen, Valais, Ticino, and parts of Aargau, Thurgau, St. Gall, and Basel; but the wine is generally inferior. In the highland cantons cider is made. Kirschwasser is distilled. Carrots, beet, turnips, and other vegetables, are cultivated. Mulberry-trees are planted and silk-worms reared in the canton of Ticino and the valleys on the Italian side of the Alps. Chestnut-trees are found in sheltered situations; walnut-trees are more generally diffused; olive-trees grow only in some favoured spots of the canton of Ticino, where also the fig and peach-trees bear abundantly, as well as in some parts of the lower Valais.

The highlands of Switzerland abound with timber-trees, especially firs of various kinds, maple, beech, larch, birch, and oak trees. Most of the cottages and farm-houses are built of wood, and the same material is used for fuel, the annual

consumption of which is enormous: a great quantity of timber is also exported to France and other countries. Coal-mines are worked in the cantons of Freyburg, Vaud, Basel, and Thurgau, but the coal is mostly of inferior quality.

Iron is found in the Jura; and there are furnaces and iron-works of some importance in the cantons of Vaud, Bern, Soleure, Basel, Aargau, and Grisons. In the Grisons there are mines of lead, zinc, and galena. Salt-springs abound, but they are generally neglected, except those of Bex in the canton of Vaud. [BEX.] The lakes and rivers of Switzerland abound with fish, especially trout of various kinds, weighing in some instances from 30 to 60 lbs. The game consists chiefly of chamois, hares, marmots, and partridges. Bears and wolves are hunted in the Alps and the Jura. Birds of prey of large dimensions are common in the mountains.

Trade and Manufactures.—Switzerland has been a manufacturing country for centuries. In the canton of Zürich the manufacture of silks, taffeta, serges, silk handkerchiefs, and ribands, gives employment to between 12,000 and 13,000 people. The cotton-manufactures of Zürich employ about 12,000 weavers, 5000 spinners, besides 4000 persons engaged in other trades connected with the cotton-manufacture. The cantons of St. Gall and Appenzell have important manufactures of cotton cloths, fine muslins, cotton prints, leather, linen, glass, and jewellery. The city of Basel forms another emporium of trade and manufactures, principally of silk ribands, silk thread, taffeta, and satins. Schaffhausen has a manufactory of steel and files, which is in great repute; one of cotton-spinning, and one of cotton-prints. It has also a good transit trade with Germany. At the opposite extremity of Switzerland, Geneva is a great mart of trade and industry. The manufactures of Geneva consist chiefly of watches, jewellery, and musical boxes; but include also cabinet work, saddlery, lithography and engraving, cutlery, fire-arms, enamels, &c. The chief industrial occupations in the canton of Neuchâtel are—cotton printing, lace-making, and more especially watch-making, which prevails greatly among the highlands of the Jura, giving employment to about 20,000 persons, who manufacture and export yearly above 120,000 gold and silver watches. The cantons of Thurgau, Glarus, and Aargau manufacture cotton-cloth, prints, and muslins of all descriptions, hosiery, silks, and ribands; in Aargau linen and cutlery are also made. The rest of the cantons of Switzerland manufacture merely what is required to supply their own wants. The manufactures find a vent in distant countries by passing through Germany and the Sardinian States to the harbours of Holland and the Mediterranean.

Militia.—Every able-bodied man from the age of eighteen to fifty belongs to the militia of his canton, and is liable to be called out by his government. The militia is divided into three classes: 1, the federal contingent, or the number of soldiers which each canton is bound to furnish in proportion to its population when called upon by the government, in case of central, foreign, or internal war; in every canton the contingent is called out once a year for a week or a fortnight for field-exercise: 2, the reserve, which consists of men who have served in the contingent, and is liable to be called out in cases of urgency. As a last resource for the defence of the country, the *levée en masse*, called 'landsturm,' includes all men who are able to bear arms. The men, both of the contingent and the reserve, are mostly armed and accoutred at their own expense, or, if too poor, are supplied with arms by their respective cantons. The Swiss have been always inclined to the military profession, and many of the cantons used to furnish regiments for the service of foreign powers. Most of the cantons have in recent times forbidden foreign enlistment; but some of them still have a few regular regiments in the service of the Pope and the King of Naples. The courage of the Swiss soldier has been always acknowledged; and his fidelity to his colours under the most trying circumstances was proved in the first and second French revolutions.

Education.—Elementary instruction has been greatly ameliorated of late years in many of the Swiss cantons. The Catholic cantons are said to be most behind in this respect. Secondary instruction is given in the gymnasia and grammar schools which exist in most of the towns. Among private schools, which are numerous, that of Fellenberg, at Hofwyl, holds the first rank. [HOFWYL.] With regard to scientific instruction, there are in Switzerland the universities of Basel and Zürich, and the academies of Geneva, Bern, and Lausanne, in which degrees in divinity, law, and arts are granted.

The Heimathlosen.—Hospitals for the infirm poor exist in every town, and some of them are richly endowed. The indigent receive assistance from the funds of the commune to which they belong. It is therefore of great importance for every man to be inscribed as freeman of a commune. But there is a class of poor called Heimathlosen (homeless) who have no legal right to relief and are rejected by all the cantons; they are descended from individuals who lost their civil rights in their respective cantons, or from foreigners settled in Switzerland who did not purchase their citizenship. The Heimathlosen are therefore almost of necessity vagrants, mendicants, hucksters, pilferers, and often robbers, like the gipsies of other countries. The subject has been discussed in the Federal Diet of late years, and several cantons have offered to come to an arrangement for distributing these individuals among the cantons, and restoring them to society.

Historical Sketch.—In Roman times that part of Switzerland included between the Jura Mountains and the high Alps, the lake of Geneva and the Rhine, was inhabited by the Helvetii, a fierce warlike people divided into four tribes, who seem to have formed a kind of confederation. The rest of Switzerland, comprising part of the Grisons, and some of the high eastern valleys, was included in Rhætia. The earliest event recorded of the Helvetii is the defeat and disgrace of a Roman army under C. Cassius, by the Tigurini, one of the four tribes, about 110 B.C. About half a century

later, the Helvetians left their country in a body with the intention of settling in the more fertile districts of Gaul; but they were met by the Romans under Julius Cæsar on the banks of the Arar (Saône), and defeated with great slaughter ('Bell. Gall.' i. 1–29). The survivors were permitted to return to their own country, and the Helvetii from that time became tributaries of Rome, and Roman colonies were soon after established in their country. On the accession of Vitellius to the empire, Cæcina, his lieutenant, overran the territory of the Helvetians, because of their fidelity to Galba, and defeated a Helvetian army under Claudius Severus. After destroying Thermæ (now Baden in Aargau), Cæcina advanced upon Aventicum, which surrendered, but saw its principal inhabitants sentenced to death by the merciless victor. (Tacitus, 'Hist.' i. 67–69.)

From this time till the early part of the fifth century, Helvetia became, with little exception, Roman in language, habits, and manners; the Rhætian portion had been so almost from the time of its conquest by Drusus. On the decline of the Roman Empire, the Burgundians spread themselves over all the western and central parts of Helvetia; the Alemanni, a wild German tribe over the northern portion along the Rhine; while the Rhætian territory and the high valleys of the Alps were seized by the Italian Goths. The old Helvetians became the serfs of these various masters; and their very name was obliterated, being merged in the more general one of Roman, by which the barbarians designated the inhabitants of the countries formerly subject to Rome.

Christianity had partially penetrated among the Helvetii in Roman times, but was not completely established till the beginning of the sixth century (about 534), after the conquest of the country by the Franks. After the division of the territories of Lothaire, the Burgundian part of Helvetia was called Transjurane Burgundy. The Alemanni, whose territories lay between the Aar and the Rhine, remained heathen till the beginning of the seventh century, when the Irish monk Columbanus and his disciples weaned this rude people from their idolatry, and taught them to cultivate the soil and other useful arts.

Under the successors of Charlemagne, the feudal system had been established; the counts or petty governors in course of time made themselves hereditary, and the crown tenants became their vassals. Many small proprietors however, dreading the rapacity of these lawless lords, placed themselves under the protection of the church, then the only barrier against feudal oppression, and hence arose a great number of abbeys, each of which had its own vassals. In 1032 the whole country was incorporated with the German Empire under Conradin the Salic, and from that time till the end of the 11th century, the worst effects of the feudal system were developed in the harassing, incessant, and bloody quarrels of a selfish, vain, and ignorant aristocracy. In 1097 Berthold of Zähringen was appointed imperial warden by Henry IV., and under his administration and that of other dukes of his house, the country had peace till 1218, when the House of Zähringen became extinct. Soon afterwards the House of Habsburg, being in possession of Austria, and having been advanced to the Empire of Germany (1273), exercised a tyrannical sway over Switzerland. In 1308 the three cantons of Schwyz, Uri, and Unterwalden, exasperated by the despotism of Gessler, shook off the yoke of Albert I., and formed the confederation of Schwyz (a name afterwards extended to the whole of Switzerland), which struggled long and successfully against Austria. The confederation was joined in 1332 by Luzern; in 1351 by Zürich; in 1352 by Glarus and Zug: Bern was admitted in 1353; Soleure and Freyburg in 1481; Basel and Schaffhausen in 1501; and Appenzell in 1513. The most important events in this long interval were—the defeat of the Austrians by the Schwyzers at Morgarten, Nov., 1315; the defeat and death of Leopold II. of Austria at the battle of Sempach, July 9, 1386; the battle of the Bridge of St.-Jacob, near Basel, where the dauphin at the head of a French army of 30,000 men with difficulty defeated 1200 Swiss; the defeat of Charles of Burgundy, at Granson, March, 1476, and at Morat in June of the same year; and the successful campaign against the Emperor Maximilian I. in 1499, which was the crowning struggle of the Swiss for their independence.

These 13 confederated cantons admitted allies or associated states to the confederation, of which the abbey of St.-Gall, the free cities of St.-Gall, Mühlhausen, and Biel or Bienne had a vote in the Diet; the allies without votes were Geneva, Neuchâtel, the Valais, and the Grisons, which last asserted its liberty in 1424.

In the early part of the 16th century (1513–31) the doctrines of the reformation were preached by Zwingli, Bullinger, Farel, and others, and adopted by the cantons Zürich, Bern, Basel, Schaffhausen, Neuchâtel, and several of the principal towns. This change led to many internal wars between the members of the confederation. In 1531 occurred the battle of Cappel, in which the reformers were defeated by the Catholics with great loss; among the slain was Zwingli himself. In 1541 Geneva adopted the religious system of Calvin. The beginning of the following century saw the civil war of the Grisons, which ended in 1639, and in which Austria and France interfered. The second war of religion broke out in 1653, and ended with the defeat of the reformers at the battle of Willmergen. The same battle-field was the scene of the defeat of the forces of Luzern and the three original cantons by the Bernese in 1712. This defeat was followed by the peace of Aarau, and Switzerland enjoyed repose till 1793, when, on the formation of the French Republic, the French democratic agents spread disaffection and division among the citizens of the confederation. In 1797 the eastern dependencies of Switzerland, including the Valteline, Chiavenna, and Bormio, were annexed by force to the Cisalpine Republic; and in 1798 the last Diet of the old Confederation was held at Aarau, and Switzerland was entirely subjected by the armies of the French Republic, with the exception of the cantons of Schwyz, Uri, and Unterwalden, which, led on by Aloys Reding, bravely repulsed the

invaders at Rothenthurm. The French formed Switzerland into a united and indivisible republic governed by a directory, the members of which were the mere puppets of France. The year 1799 saw Switzerland traversed by Austrian, French, and Russian armies, and the last defeated by Massena at Zürich. A short experience satisfied the Swiss that a central government on the French model was unsuited to their circumstances and incompatible with the different manners, usages, and languages of the people. A general insurrection, headed by the old vanguard of freedom, Schwyz, Uri, and Unterwalden, broke out in 1802 against the Helvetic government, which, supported by Vaud alone, was on the point of yielding to the confederates, when Bonaparte presented a new organisation under the name of the *Act of Mediation*, which was promulgated Feb. 20, 1803. By this act the 13 cantons recovered their former territories and rights; 6 new cantons were created, Aargau, St.-Gall, the Grisons, Tessin, Thurgau, and Vaud; so that the new confederation consisted of 19 cantons. The Valteline, Chiavenna, and Bormio, remained united to the kingdom of Italy; and several other dependencies of Switzerland were incorporated with the French Empire. Switzerland enjoyed tranquillity until the downfall of Napoleon, when Austrian armies on their way to France passed through the Swiss territory. In the same year the Diet annulled the Act of Mediation, and set about constructing a new Federal Pact, which was recognised by the Congress of Vienna in 1815, and which admitted Geneva, Neuchâtel, and the Valais as members of the confederation. By the treaty of Vienna the perpetual neutrality of Switzerland is guaranteed.

Constitution and Government.—By the Federal Pact sworn to at Zürich, Aug. 7, 1815, the 22 Swiss cantons formed a Confederation for the maintenance of their liberty and independence against foreign aggression, and also for the preservation of internal order and tranquillity. The respective constitutions and territories of the different cantons were mutually guaranteed. Each canton formed an independent state, with unfettered liberty of interior administration. Affairs relating to general interests were regulated by a diet of 22 deputies, one for each canton, which met every year in one of the three cantons Zürich, Berne, and Luzern, each of which was in its turn the seat of the diet for two years, and was for that time styled the Vorort, or directing canton. The diet, which was presided over by the chief magistrate of the Vorort, declared war, made peace, concluded treaties and alliances with foreign states; named diplomatic agents; took all measures for the organisation and disposal of the troops of the contingent force, and for the security of Switzerland internally and externally. When the diet was not sitting, the conduct of public affairs was entrusted to the vorort. Each canton might, and many did, treat with foreign governments for military service, and in matters of economy and police, if they did not infringe upon the Federal Pact, or the rights of the other cantons. The fundamental principles of the Federal Pact relating to the interior were the preservation of convents, the abolition of family and local privileges, equality of rights for all Swiss, the free purchase of provisions, right of ways and bridges, &c. The constitutions of the several cantons differed, as did also their legislation and administration; but, with the exception of Neuchâtel, which formed a sort of limited monarchy, the cantons were generally speaking either purely democratic, the chief power (as in Schwyz, Uri, Unterwalden, Appenzell, Glarus, and Zug) vesting in the body of citizens at large (Landesgemeinde), who met in the open air for purposes of legislation and finance, and to elect their chief officers and representatives in the diet; or they had a representative form of government, the citizens electing deputies, whose assembly, called the Grand Council (Grosse Rath), held open sittings, and exercised generally all the rights of the Landesgemeinde. In St.-Gall, Basel, Valais, Luzern, and some other cantons, however, the people had a veto upon the projects of law that passed the Grand Council. In several of the cantons also there was a strong tinge of aristocratic feeling and influence, many of the old families having held patents of nobility since the time of the connection of Switzerland with the German Empire; and though this class had no recognised exclusive privileges above the rest of the citizens of the canton, it often exercised great weight in legislation and administration. Alterations in the constitution of each canton were submitted to the votes of all its citizens.

The preceding sketch contains much that is still applicable to Switzerland; but the Federal Pact no longer exists; revolutions have taken place in many of the cantons, and the federal constitution itself has of late been entirely changed. The progress of this change it remains briefly to trace.

The party of progress in Switzerland, sometimes called Radicals, sometimes Unitarians, from the object they had in view, have ever since the French Revolution of 1830 cherished the idea of a closely-united republic, worked under the influence of a unitary or central government. The obvious tendency of this system was to give the Vorort a sovereign power over the other members of the confederacy, and to break down the independence of the several cantons; it was therefore opposed by the old aristocracy and the old democratic cantons, which parties assumed the character and name of 'conservatives.' In 1832, after the diet had decided to revise the Federal Pact, the Catholic cantons of Schwyz, Uri, and Unterwalden, from distrust of radical influence in the diet, formed the *League of Sarnen*, which was afterwards joined by Freyburg, Zug, Luzern, and Valais. Subsequently, in 1839, a law of the diet came into operation, enforcing a system of education independent of the clergy, who were supposed greatly to counteract radical influence. So great was the opposition to this law, that in the canton of Zürich, the pastors headed the peasants, and entering the city of Zürich, demanded, and, after some violence, obtained, a dissolution of the existing radical government. In the Catholic cantons the priests were said to be very successful in their efforts to resist the

influence of the central government party; thus a religious dispute came to be mingled with the political struggle, and the Jesuits, who in 1840 received the control of public education in Luzern, which they already exercised in some other cantons, became the direct marks of radical antagonism. Radicalism nevertheless was spreading, and its professors were able to maintain themselves in power against insurrection in Aargau and Soleure, in the former of which all the monasteries were suppressed. From Aargau, a proposition came before the diet in 1844, for the expulsion of the Jesuits from Switzerland, but it was supported only by the vote of Aargau and the half vote of the country portion of Basel. Disappointed at the decision of the diet, the radical party had recourse to violence, and a body of armed men, called the Free Corps, under the command of Ochsenbein, invaded Luzern in April, 1845, and were severely defeated. This attack, coupled with the refusal of the cantons that maintained the free corps to dissolve that body, led the cantons of the league of Sarnen to form a closer union. Accordingly, in 1846, the Sonderbund, or Separate League, consisting of Luzern, Uri, Schwyz, Unterwalden, Freyburg, Zug, and Valais, was formed, and announced its existence to the whole federation. The Sonderbund, on the plea of defending themselves against the free corps, had an armed and military organisation; and whatever palliation may be drawn from the circumstances in which it originated, it seems clearly to have been an infringement, if not tantamount to a dissolution, of the Federal Pact. The expulsion of the Jesuits, and the legality of the Sonderbund, thus became the leading questions by which the country was agitated. The Grand Council of Geneva having accompanied its condemnation of the Sonderbund with a declaration against the free corps, stating that public order ought to be maintained, was deposed by the radical party, who established (Oct. 7, 1846) a provisional government, which, on the 10th of November following, submitted to the Council of State a resolution alleging that the Sonderbund was an infringement of the Federal Pact, and ought to be dissolved. In July, 1847, this resolution came before the diet, which was held at Bern, under the presidency of Ochsenbein, who had been raised to the chief magistracy of the Vorort by a revolution in 1845. The diet decreed (July 20, 1847) that the Sonderbund was illegal, and on the 3rd of Sept. following, that the Jesuits should be expelled from the Catholic cantons. Against these decrees the Sonderbund protested, and both parties prepared for armed contest. On the 4th of Nov. the diet decided that the decree of July 20 should be carried into execution by force of arms; and this was done by the federal army under General Dufour, who defeated the forces of the Sonderbund at Freyburg (Nov. 13) and at Luzern (Nov. 24); after these defeats, the leagued cantons sent in their submission to the diet. They were made liable for all the expenses of the war, the monasteries, not even excepting the Hospice of St. Bernard, were all suppressed, and the Jesuits expelled. These matters did not however take place without the interference of foreign powers; French and Austrian forces had approached the Swiss frontier, and the five great powers, through their diplomatic agents, had been meditating a proposition of mediation between the two contending parties; but before they could agree about the terms of their joint note, the matter was decided by arms, and when it was presented the answer was, that the note was now inapplicable to the circumstances. Undisturbed by the shock of revolution by which the surrounding countries were soon after agitated, Switzerland had now time to revise her constitution, a project which had been decreed on the 16th of the preceding August. The commission appointed for this purpose proposed—1, a Federal Assembly; 2, a Federal Council; and 3, a Federal Tribunal. This project was solemnly accepted and promulgated as the fundamental law and constitution of the republic, in a decree dated Sept. 12, 1848.

The sovereign power is vested in the *Federal Assembly*, which consists of two chambers, the National Council and the Council of State or Senate. The *National Council* consists of 111 members, elected by the cantons for three years, in the proportion of one member for every 20,000 inhabitants, the half-cantons returning one member at least; and when a canton has a surplus population amounting to 10,000, it is entitled to have an additional representative. The *Council of State* consists of 44 members, two representatives for each canton, the half-cantons returning only one each. The federal assembly chooses, from among the citizens eligible to the national council, the *Federal Council*, which consists of seven members, and holds office for three years. The federal council is the ministry of the confederation; its members conduct the departments of politics, the interior, the military, finance, commerce and customs, public works, justice and police. The president and vice-president of the federation, and of the federal council, are named annually in a united sitting of the federal assembly, and may not be re-elected for the space of a year after their term of office expires. The *Federal Tribunal*, also appointed by the federal assembly for three years, consists of 11 members and 11 substitutes. This tribunal decides in civil matters between the cantons, between these and the confederation, between the cantons and private parties, and in suits arising about the reception of the Heimathlosen. For criminal business it is divided into sections. On the 28th of Nov., 1848, the city of Bern was chosen as the federal city by both chambers of the federal assembly.

(Franscini, *Statistica della Svizzera;* Leresche, *Dictionnaire Géographique-Statistique de la Suisse;* Ebel's *Handbuch für Reisende in der Schweitz;* Kasthöfer's *Voyage dans les Petits Cantons et le Pays des Grisons;* Rösch, *Die Schweitzer Alpen*, in Berghaus's *Almanach* for 1841; Hoffmann, *Die Deutschland und seine Bewohner;* Berghaus, *Annalen der Erd-Völker- und Staatskunde.*)

SWORDS, MANUFACTURE OF. Several countries have become celebrated for the excel-

lence of the swords manufactured by the inhabitants. The swords of Toledo were famed even as far back as the time of the Romans. The Milan swords have likewise had a high reputation. But the Damascus swords have had the widest celebrity; though no such manufacture is now carried on in that city. All the Damascus swords now existing are of old date.

About the year 1689 an attempt was made to improve and extend the sword manufacture of England by the incorporation of a company of sword-cutlers for making hollow sword-blades in Cumberland and the adjacent counties. The company was empowered to purchase lands, to erect mills, and to employ a great number of German artificers; yet the project failed. Owing apparently to the parsimony of the manufacturers, which led them to use inferior materials, and to employ unskilful workmen, English sword-blades fell into very ill repute during the 18th century; so much so, indeed, that an English officer would not trust his life to the hazard of the probable failure of a sword of native manufacture. Attention having been drawn to this subject, the late Mr. Gill of Birmingham entered into competition with the German sword-cutlers, and produced swords even superior to those of the German makers. The tendency of recent years has been to bring the chief European nations nearly to a level in this manufacture.

The process of manufacturing swords at Birmingham is as follows:—The material of which the blade is wrought should be cast-steel of the very best quality, and wrought with the greatest care. Of this material, besides the quantity prepared at Birmingham, much is obtained from Sheffield in the form of bars, called sword-moulds. These bars are heated in the fire, and drawn out upon an anvil by two workmen with hammers, giving alternate strokes. When the blade is required to be concave upon the sides, or to have a reeded back, or some similar ornament, it is hammered between steel bosses or *swages*. The blade is then hardened by heating it in the fire until it becomes worm-red, and is then dipped, point downwards, in a tub of cold water. It is tempered by drawing it through the fire several times until the surface exhibits a bluish oxidation, which takes place at a temperature of about 550° Fahr. The sword is then *set* to the required shape by placing it on a sort of fork upon the anvil, and wrenching it by means of tongs in the direction required to correct any degree of warping which it may have contracted during the hardening. The grinding is performed upon a stone with either a flat or fluted surface, acording to the kind of blade; and as the uniformity of the temper is impaired by this process, it is subsequently restored by a slight heating, after which the blade is glazed with emery, and, if the instrument be a fine one, with crocus martis, after the manner of a razor-blade. The sword is then ready for the hilt or handle, the variety of which it is needless to enumerate.

Among the tests to which sword-blades are subjected in order to prove their flexibility and elasticity, is that of bending them into a curve by pressing the side of the blade against six or eight pegs or stout nails driven into a board, in such a manner that, when in contact with all the pegs, the middle of the blade may be bent six or seven inches from a straight line drawn between the point and the hilt. A further test is applied by an apparatus consisting of a vertical pillar rising from a board. The point of the sabre is placed upon the board at the foot of the upright pillar, and the hilt is then pressed down until the middle of the blade bends away from the upright piece to the required degree; the amount of curvature being shown by a peg which projects horizontally from the pillar, about midway between the top and the bottom. The temper is also proved by striking the blade smartly upon a table on both sides, and by severe strokes with the back and edge upon a block. Mr. Inglis, in his 'Spain in 1830,' describes the trials to which sword-blades are subjected at the celebrated manufactory of Toledo. Each sword is there thrust against a plate in the wall, and so bent into an arc forming at least three parts of a circle, and then struck edgeways upon a leaden table with all the force which can be given by a powerful man holding it with both hands. The polishing, according to the same authority, is performed upon a wheel of walnut-wood.

The ancient Damascus sword-blades have a peculiar wavy appearance on the surface, which is called *damascene* or *damasking*. Various modes have been adopted for imitating this appearance; but it is not known whether any of them are identical with the original practice.

SWORDS. [DUBLIN, County.]

SYBARIS, a Greek city in Lucania, in southern Italy, situated between two rivers, the Crathis, now called Crati, and the Sybaris, which at present is called Coscile, Coscilello, or Siburi. It was a colony founded about the year B.C. 720, by Achaians and Troezenians. This colony soon increased in wealth and power; for at the time of its greatest prosperity, that is, about two hundred years after its foundation, it had, according to Strabo, acquired the dominion over four neighbouring tribes, had twenty-five subject towns, the city itself occupied a space of fifty stadia in circumference, and the Sybarites were enabled to send an army of 300,000 men into the field, a number which seems quite incredible. Sybaris became the mother of other colonies, such as Posidonia, and carried on considerable commerce. But the prosperity of Sybaris had a pernicious influence on the people, and within the short period of two hundred and ten years that Sybaris existed, the effeminacy and the luxury of the inhabitants were carried to such a pitch, that the name Sybarite became proverbial and synonymous with a voluptuous person. The power of Sybaris seems to have been in the hands of an aristocracy, and the struggle between this aristocracy and the commons resulted in a civil war, which led to the total destruction of Sybaris (B.C. 510). In B.C. 444 the colony of Thurii was founded a little to the south of the site of Sybaris. The new colony was composed of a remnant of the Sybarites, and of other Greeks, among whom were Herodotus the historian, and Lysias the orator.

The site of the ancient Sybaris is uncertain, but it is generally supposed to be near the modern Torre Brodognato, or Terra Nuova.

SYCAMORE. [ACER.]

SYDENHAM, THOMAS, was the son of a country gentleman at Winford Eagle, in Dorsetshire. He was born there in 1624, and was admitted a commoner of Magdalen Hall, Oxford, in 1642. The occupation of that city as a garrison by Charles I. interrupted his studies for a time; but he returned to Magdalen Hall when Oxford was given up to the parliamentary forces, and in 1648 he took the degree of bachelor of physic.

About 1648 he obtained a fellowship of All Souls' College. He pursued his studies at Oxford for some years, and is said to have visited Montpellier, where there was a celebrated medical school. Subsequently he quitted Oxford; and having taken the degree of doctor of medicine at Cambridge, he became a licentiate of the College of Physicians, and settled in London.

He soon rose in his profession, and, between the years 1660 and 1670, had a more extensive practice than any other physician. After suffering for many years from the gout, he died Dec. 29, 1689, at his house in Pall Mall, London.

In 1666 Sydenham published his first work, which consisted of observations upon fevers. An enlarged edition of this treatise appeared under a new name in the year 1675. Remarks on the epidemic diseases of London from 1675 to 1680, a treatise on dropsy and on the gout, and a tract on the rise of a new fever, were his principal other publications.

The translation of his works by Dr. Swan is well executed; the best edition of it is that of Dr. Wallis, in 2 vols. 8vo., published in 1789.

SYDENHAM, FLOYER, born in 1710, was educated at Wadham College, Oxford, and took the degree of M.A. in 1734. Having undertaken the laborious task of translating Plato into English, he issued proposals for publishing his work by subscription in 1759, accompanied by a 'Synopsis, or General View of the Works of Plato.' The subscribers were few; and some, it is said, failed in their engagements; and after a life of labour and want, he died in old age (April 1, 1787), imprisoned for a debt. Melancholy as was his end, it had a beneficial result; for in consequence, one of the members of a club at the Prince of Wales Coffee-house proposed that it should adopt as its object some means to prevent similar afflictions, and to assist deserving authors and their families in distress; and this was the origin of the London Literary Fund Society, which is still in a flourishing condition.

Between 1759 and 1780 Sydenham published translations of the Io, Greater and Lesser Hippias, Banquet, Rivals, Meno, First and Second Alcibiades, and Philebus, with notes: these are collected in three quarto volumes. These versions were afterwards included by Thomas Taylor in his complete translation of Plato, 1804, revised, and with a selection of the notes.

Sydenham's other works are, 'A Dissertation on the Doctrine of Heraclitus, so far as it is mentioned or alluded to by Plato,' 1775; 'Onomasticon Theologicum, or an Essay on the Divine Names, according to the Platonic Philosophy.'

SYDENHAM, CHARLES EDWARD POULETT THOMSON, LORD, was the son of John Poulett Thomson, Esq., of Waverley Abbey and Roehampton in Surrey, the head of the firm of Thomson, Bonar, and Co., which had been long engaged in the Russian trade. He was born at Waverley, Sept. 13, 1799. He was never at any public school or university; and he left his native country at the age of sixteen, to be placed in his father's house of business at St. Petersburg. He returned to England in ill health in 1817; then made a tour to the south of France, Switzerland, and Italy; after which he took his place in his father's counting-house in London, in the summer of 1819. In the spring of 1821 he was again sent out to St. Petersburg, and remained for two years. The greater part of the winter and spring of 1823–4 he spent in Vienna; whence returning by Paris to England, he assumed, in conjunction with his brother Andrew, the chief management of the business in London.

Sanguine, ambitious, and self-confident, he involved himself to some extent in the American mining speculations of 1825. Meanwhile he had set his heart upon entering public life. He obtained a seat in parliament for Dover, in 1826. His rise from this date was very rapid. Voting steadily with the extreme section of the Opposition, he spoke but seldom, and almost exclusively upon commercial questions. He was again returned for Dover in 1830; and when the Whigs came into power, in Nov. of that year, he was appointed to the offices of Vice-President of the Board of Trade and Treasurer of the Navy. He was returned again for Dover after his acceptance of office, and also to the succeeding parliament, which met in June, 1831. At the general election in Dec., 1832, he was returned both for Dover and for Manchester; he elected to sit for the latter place; and continued to represent Manchester as long as he remained in the House of Commons. Meanwhile on the reconstruction of the ministry in June, 1834, Mr. Poulett Thomson was made President of the Board of Trade; and on the recovery of power by his party in April, 1835, after Sir Robert Peel's short administration, he resumed that office with a seat in the cabinet. Towards the close of the session of 1839, on the elevation of Mr. Spring Rice to the peerage, he was offered his choice between the offices of chancellor of the exchequer and governor of Canada; and accepted the latter. He left England Sept. 13, and landed at Quebec Oct. 19, 1839. In Aug., 1840, he was raised to the peerage by the title of Baron Sydenham, of Sydenham, in Kent, and Toronto, in Canada. But on Sept. 4, 1841, while in ill health, he was thrown from his horse, which fell upon him, and he died Sept. 19, 1841. His memoirs have been written by his brother, Mr. Poulett Scrope, the present member for Stroud.

SYDNEY, the capital of New South Wales, on the east coast of Australia, is situated on the south side of the beautiful bay called Port Jackson, in 33° 55′ S. lat. and 151° 25′ E. long.

The east coast of Australia, north and south of the entrance to Port Jackson, consists of sandstone cliffs rising precipitously from the water's edge to the height of 200 or 300 feet. On approaching the coast from the east, the line of perpendicular cliffs appears to be continuous; but, on coming nearer, an opening is perceived between two lofty headlands, which are called the North Head and the South Head. Within these headlands, a point of land called Middle Head stretches out from the south side of the bay in such a manner as to protect it completely from the easterly winds and the swell of the Pacific. After passing round Middle Head a capacious bay is seen, which extends in a westerly direction about 15 miles from the coast, the width varying from about a mile to three miles, with excellent anchorage for the largest vessels. This is Port Jackson, one of the finest natural harbours in the world. At the entrance the width is about three-quarters of a mile, but it soon spreads out to about three miles. At Sydney the width is a mile and a half. Fifteen miles inland, at the head of the bay, there is a creek, seven or eight miles long, and navigable for boats of 12 or 15 tons burthen. At the head of this creek is the town of Paramatta, and the creek itself is called Paramatta River, from a small but constant stream which flows into it.

Sydney is about 7 miles from South Head, on the south shore, and is built partly on the west side of Sydney Cove, but chiefly on the low ground, between two rocky promontories, which are separated by three inlets, Farm Cove, Sydney Cove, and Darling Harbour, or Cockle Bay. The principal streets run inland to the south, and are crossed at right angles by others which terminate on the west at the shore of Darling Harbour. The Government House and Government Domain limit the extension of the town to the east and north-east: it extends to the south, from Daws's Battery, to the burial-grounds, nearly three miles. Sydney Cove reaches only a short distance inland. Darling Harbour is much more extensive than Sydney Cove, running inland to the south some distance beyond the town. A finer situation for a large mercantile city can hardly be imagined. The water is deep, the shores are precipitous, and the wharfs so situated that cargoes can be hoisted from the holds of the largest ships up to the floors of the warehouses.

The houses in the principal streets are generally two stories high, but many are three; some are built of brick, some of sandstone, and some are of wood. Many of the shops are fitted up with plate-glass windows, chandeliers, and other decorations, in the most costly style of London or Paris. The side-pavements for foot-passengers are made with small stones, not with flags, but some are of asphalte.

There are no public buildings in Sydney which particularly merit notice for their architecture. The Government House is beautifully situated on the east side of Sydney Cove: the building has become large by additions, but is of the plainest and simplest kind. The other public buildings are—the Commissariat Store, the Military Hospital, St, Philip's Church, St. Andrew's Church, the Roman Catholic chapel, which is a gothic building of stone and the most handsome structure in Sydney, the Court House, the Council Chambers, the Colonial Hospital, the Convict Barracks, Sydney College, the Australian College, the Asylum for the Aged and Infirm, the Lunatic Asylum, and the Royal Victoria Theatre. The market-place consists of four oblong buildings, and is a very convenient structure.

Building-ground in the principal streets of Sydney is enormously dear. House-rent also is exceedingly high.

The population of Sydney, according to the census of 1841, was as follows:—

Born in the colony . . .	7,000
Arrived free	17,332
Others free	3,356
Ticket-of-leave holders . .	207
Convicts in government employ .	1,018
Convicts in private service . .	1,060
	29,973

In 1839 the commerce of Sydney employed 50,000 tons of British shipping, navigated by 3000 seamen; and there were 150 vessels belonging to Sydney, worth 300,000*l*. Wool is the great article of export, and next to it are whale-oil and whalebone, the produce of the southern whale fishery. Timber is also exported in considerable quantities.

The wages of mechanics average from 5*s*. to 8*s*. a day; and all trades required in house building and furnishing are in great and constant demand.

Sydney is the great emporium of literature for Australia and the neighbouring islands. There are several newspapers published in the town, one or more daily; the rest are mostly thrice and twice a week. There is a Mechanics' Institute called the School of Arts. Of scholastic institutions there are the Sydney College, with about 120 scholars, and the Australian College, with about 70.

Sydney, being the seat of the colonial government of Eastern Australia, is the residence of the governor, and here the legislative council holds its sittings. It is also the seat of the supreme court of justice and of the police court.

The distance of Sydney from Plymouth by the Cape of Good Hope is about 13,000 miles.

In 1787 the British government had determined to form an establishment in Australia, in order 'to empty the gaols and houses of correction; to transplant the criminals to a place where, by labour, with moral and religious instruction, their conduct may be reformed; to afford at the same time an asylum for free emigrants; and to provide a present relief and future benefit to the mother-country.' With these objects in view Captain Arthur Phillip, of the royal navy, sailed from Portsmouth, May 13, 1787, with 11 ships, intending to settle the colony at Botany Bay, where he arrived January 20, 1788. Botany Bay however was found to be by no means an eligible harbour, being open to the easterly winds, which whenever they blow violently roll in a heavy sea from the Pacific; besides which the land was found

to be nothing but swamps and sand. Captain Phillip sailed immediately in search of a more suitable place of settlement, and fixed in a few days on the locality of the shores of Sidney Cove in the bay of Port Jackson. Port Jackson is said to have derived its name from a sailor of the name of Jackson, who first discovered the entrance between the two headlands, and the name of Sydney is stated to have been given to the new town in honour of Lord Sydney, who was a lord of the admiralty (some say, a secretary of state) at the time when Captain Phillip settled the colony on its present site.

SYLBURG (Latinised SYLBURGIUS), FRIEDRICH, was born in 1536, in the village of Wetter, near Marburg. He received a good education, and during the time spent at the university of Jena he chiefly devoted himself to the study of Greek under Rhodomannus. After the completion of his academical course, he had the management of several public schools. But he had no particular liking for teaching, and his occupation took up all the time which he wished to devote to literary labours. Accordingly he gave up his post, and entered into a connection with the printer Andreas Wechel, of Frankfort on the Main, for whose establishment Sylburg undertook to edit Greek works. He continued at Frankfort until 1591, when he went to Heidelberg, and formed a similar connection with the printer Hieronymus Commelin. In both places Sylburg, who had the superintendence of the printing of all Greek works, as well as the preparation of them, performed these duties with the utmost accuracy, and showed an extraordinary critical talent in the notes which accompanied almost all his editions. He died at Heidelberg, Feb. 16, 1596, as is stated on his tomb-stone, which still exists at Heidelberg.

Sylburg was one of the most eminent and most industrious Greek scholars of the 16th century. He was a worthy contemporary of Henry Stephens, whose Thesaurus of the Greek language contains many articles by Sylburg. The editions of Greek writers by Sylburg are still very valuable, and in critical accuracy they are not inferior to those of Stephens, although they are not so beautifully printed.

SYLLA. [SULLA.]

SYLLABLE (*συλλαβή*). A syllable consists of one or more elementary sounds of a language uttered in one emission of voice. The interjection Oh, is an example of a syllable consisting of one elementary sound; and the syllable *strange* is an example consisting of several elementary sounds articulated (joined) together. Words which consist of one syllable are termed monosyllabic; those consisting of two are termed disyllabic; those of three, trisyllabic; and those of more than three are indefinitely termed polysyllabic.

Spoken language is a system of audible signs for the expression of thought, and written language is a system of signs to express spoken language, so that written language is two removes from thought. Syllables, both as words and as parts of words, belong both to spoken and written language.

In a pronounced syllable two distinct things are observable: 1st, its elementary structure; and, 2nd, the musical properties of the voice, consisting of those distinctions of sound which are described under the general terms pitch, loudness, and quality. Thus in the pronoun *I* we observe the elementary structure to be the diphthongal vowel *I*, as heard in the word *isle*; and we observe also whether the syllable be said or sung, that is, whether the condition of the voice belongs to speech or to song; an accurate observer also perceives the precise degree of pitch and loudness, and the character of the quality of voice.

The time which a syllable occupies in pronunciation is termed its quantity. In solemn and stately discourse the quantities of syllables are extended beyond their ordinary length; while in rapid discourse they are somewhat shortened. The ordinary quantity of a syllable, when neither extended nor protracted, is the sum total of the quantities of its constituent elementary sounds.

It would occupy much space to describe the operations of the causes which limit and determine the quantities of syllables. Those causes are, the singleness of the vocal emission, and the elementary structure of the syllable.

Syllables are of various lengths, from an extremely short to a very long quantity, as in the examples *it, hot, out, long, length, strength*, which form an increasing series.

In words of more than one syllable, one of them is always made more conspicuous to the ear than the other, by what is termed stress or accent. Stress is produced either by an abrupt percussion of voice, as in the word *pepper*, or by an extended quantity or a swelling loudness of voice, as in the word *amaze*. The stressed syllable of a word is invariably that which receives the modification of voice expressive of sense and feeling, called emphasis.

The metrical arrangement of language depends on the quantity and stress of syllables, both of which are inherent; while the pitch, loudness, and quality of voice in which the syllables are uttered are accidental, and belong to the thought and feeling of the speaker.

SYLLOGISM. Every sentence in which the conclusion is a necessary consequence of previous assertions contained in that same sentence, is a syllogism, provided that the conclusion be obtained from two distinct assertions, and two only. Thus 'Some As are Bs, for every B is A,' is not a syllogism, though logically true. Every ordinary assertion may be reduced to one of four forms, the universal affirmative, the universal negative, the particular affirmative, and the particular negative. From these, by combination, all syllogisms are derived; and the laws of combination, and the manner of expressing them, constituted that branch of science which is now often turned into ridicule, particularly as to its notation, and the strange and uncouth words by which the species of syllogisms were denoted. The following letters always signify the several species of propositions:—

A, the universal affirmative; every X is Y.

E, the universal negative; no X is Y.

I, the particular affirmative; some Xs are Ys.
O, the particular negative; some Xs are not Ys.

Since every conclusion must be drawn from the comparison of two things with a third, a syllogism consists of two propositions, in each of which the same term occurs compared with another; this term is called the *middle term*. Thus in

Every Y is X,
Every Z is Y,
Therefore Every Z is X,

Y, the subject of the first assertion, and the predicate of the second, is the middle term. The two first assertions are the *premisses*, the third is the *conclusion*. The predicate of the conclusion is called the *major term*; the subject of the conclusion, the *minor term*: and the major or minor premiss is that which contains the major or minor term of the conclusion. The major premiss is always written first.

The order of the terms in the premisses and conclusion must be either

I.	II.	III.	IV.
YX	XY	YX	XY
ZY	ZY	YZ	YZ
ZX	ZX	ZX	ZX;

and these are called the four *figures*. The first three are in Aristotle, the fourth was by tradition ascribed to Galen, and was called Galenic. In the first figure the middle term is the subject of the major, and the predicate of the minor; in the second, the predicate of both; in the third, the subject of both; in the fourth, the predicate of the minor and the subject of the major. Every particular case of a figure is called a *mood*; and since either of the premisses may be either of the four species of propositions, A, E, I, O, it follows that there are sixteen moods in each figure, or sixty-four possible moods in all. But of these, many are inconclusive, and many moods which admit of conclusion in one figure do not in another.

If all the sixty-four cases be examined (a most useful exercise) it will be found that the following syllogisms are valid.

First figure: AAA, EAE, AII, EIO.
Second figure: EAE, AEE, EIO, AOO.
Third figure: AAI, IAI, AII, EAO, OAO, EIO.
Fourth figure: AAI, AEE, IAI, EAO, EIO.

As to figures: Any proposition may be proved in the first; none but negatives in the second; none but particulars in the third; and everything but the universal affirmative in the fourth.

As to moods: From premisses both negative or both particular, no conclusion follows: where one premiss is negative, the conclusion is negative; and where one premiss is particular, the conclusion is particular.

In order to remember the figures certain words have been long used by writers on logic, which make a grotesque appearance.

First figure: Barbara, Celarent, Darii, Ferio.
Second figure: Cesare, Camestres, Festino, Baroko.
Third figure: Darapti, Disamis, Datisi, Felapton, Bokardo, Ferison.
Fourth figure: Bramantip, Camenes, Dimaris, Fesapo, Fresison.

Thus the vowels AAA are seen in *Barbara*, AII in *Datisi*.

Thus when we say that *Camestres* (AEE) is a valid mood of the second figure, we mean to assert that 'Every Z is Y' and 'No X is Y' gives 'No X is Z' as a necessary conclusion.

Before the fourth figure was in general use, its moods were (with order of premisses transposed) called indirect moods of the first figure; and the words used to denote them were: Baralip[ton], Celantes, Dabitis, Fapesmo, Frisesom[orum].

Several accessions to the theory of the syllogism have been proposed within the last few years. See Boole, 'Mathematical Analysis of Logic,' 1847; De Morgan, 'Formal Logic,' 1847; Baynes, 'Essay on the New Analytic of Logical Forms,' 1850 [a description of Sir William Hamilton's system, promulgated in 1840].

SYLVE'RIUS, son of Bishop Hormisdas, and a native of Campania, succeeded Agapetus as bishop of Rome, A.D. 535. Soon after, Belisarius came with an army sent by the Emperor Justinian, defeated the Goths, and took possession of Rome. Vigilius, a deacon of Rome, intrigued with the court of Constantinople to have Sylverius deposed, on the pretence that he favoured the Goths, and Sylverius was accordingly seized by order of Justinian, and sent into exile to Patara, A.D. 537, where he soon after died, and Vigilius was put in his place.

SYLVESTER I., II., III. [POPE.]

SYLVESTER, JOSHUA, was born in 1563. He appears to have engaged in mercantile pursuits, and was a member of the company of merchant-adventurers at Stade. In the latter part of his life he emigrated to Holland, and died at Middelburg in 1618. Both in his opinions and in his choice of friends he was strongly puritanical; and those numerous versified works, chiefly translations from the French, to which he owed his literary reputation, show a warmly devotional and serious tone of feeling. There are two collected editions of Sylvester's works, both in folio, 1633 and 1641. The second of them contains a supplement of posthumous poems.

SY'LVIADÆ, Mr. Vigors's name for a family of *Dentirostres*, the second tribe of his order *Insessores* (*Warblers*).

Mr. Vigors remarks that the *Sylviadæ*, the *Warblers* of our British ornithologists, assimilated as they are to the *Merulidæ* in the sweetness and compass of their vocal power, are separated from that family chiefly by their more delicate structure and more subulate bill. ('Linn. Trans.,' vol. xiv.)

Mr. Swainson also places the *Sylviadæ* in the dentirostral order. 'The chief peculiarity,' says that zoologist, 'which runs through this numerous family, is the very small size and delicate structure of its individuals. Excepting the hummingbirds, we find among these elegant little creatures the smallest birds in the creation. The diminutive golden-crests, the nightingale, the white-throat, and the wood-wren, are all well-known examples of genuine warblers, familiar to the British naturalist. The groups of this extensive family, spread over all the habitable regions of

the globe, are destined to perform an important part in the economy of nature: to them appears entrusted the subjugation of those innumerable minute insects which lurk within the buds, the foliage, or the flowers of plants; and thus protected, escape that destruction from swallows to which they are only exposed during flight. The diminutive size of such insects renders them unfit for the nourishment of the thrushes and the larger insectivorous birds, while their number and variety only become apparent when the boughs are shaken and their retreat disturbed. How enormous then would be their multiplication had not nature provided other races of beings to check their increase? No birds appear more perfectly adapted for this purpose than are the warblers.' Mr. Swainson then notices their arrival, for the most part, on the first appearance of spring, when the insect-world is called into life and activity by the renewal of vegetation; and their departure towards autumn, when the insect-hosts diminish, and consequently no longer require the agency of these little birds to keep their numbers within due bounds. He remarks, that as different localities are assigned to different tribes of insects, so a similar diversity of haunts is allotted to the various groups of warblers. Thus the golden-crests and wood-warblers (*Sylvianæ*) confine themselves principally to the higher trees, where they search for winged insects among the leaves, or capture them, like the flycatchers, when attempting to escape. The reed-warblers and the nightingales (*Philomelinæ*) haunt, he observes, the vicinity of waters, or the more dense foliage of hedges, for insects peculiar to such situations. The stonechats (*Saxicolinæ*), on the contrary, prefer, he remarks, dry commons and wide extended plains, feeding on insects appropriated to those localities; while those insects which affect humid and wet places are the chosen food of the wagtails and titlarks (*Motacillinæ*); and lastly he points out that the *Parianæ*, or titmice, search assiduously among the buds and tender shoots of trees, thus destroying a multitude of hidden enemies to vegetation.

Alauda, Larks, Wrens, Black-cap, Nightingale, Pipit, Titlark, &c. The Titmice are placed by Mr. Vigors among the *Pipridæ*, but they appear to constitute a family of themselves. The *Redbreast*, or *Robin*, is included in the group of Warblers.'

Mr. G. R. Gray makes the *Sylviadæ* the first family of his third tribe (*Dentirostres*) of *Insessores*, with the following subfamilies:—1, *Maluriæ*; 2, *Sylviinæ*; 3, *Saxicolinæ*; 4, *Accentorinæ*; 5, *Parinæ*; 6, *Sylvicolinæ*; 7, *Motacillinæ* (*Motacilla*, Linnæus).

SYMBOLS and NOTATION. The word symbol (from the Greek 'sýmbolon,' σύμβολον) means 'that which is taken with,' and a symbol is a mark which is always attached to some one particular meaning. Notation (*nota*, a known mark) is the method of selecting and assigning meaning to symbols, and the theory of notation (if it yet deserve the name) includes the consideration and choice of symbols, with the formation of rules of selection, so as to take the symbols which are best adapted for the purpose.

A picture is a symbol, the force of which lies in the resemblance to its object, and many of the earliest symbols must have been pictorial. Symbols are to the progress of civilisation precisely what mechanism is to that of the arts,—not a moving force, perfectly dead in themselves, but capable of being made the medium by which the power is conveyed to its destination, and adapted to its object. They are the instruments of our first thoughts and the originators of new ones. The process by which the earliest symbols called out a yet higher intelligence than that which produced them, which last was again employed in perfecting the symbols themselves, and so on alternately, exactly resembles what has taken place in the mechanical arts. The earliest and rudest tools were first employed to make better ones; and every improvement in the use of force has found one of its best applications in the construction of machinery itself.

Signs are of two kinds: 1st, those which spring up and are found in existence, but cannot be traced to their origin; 2ndly, those of which we know either the origin, or the epoch of introduction, or both. Those of the first kind pass into the second as inquiry advances.

Mathematical marks or signs differ from those of written language in being almost entirely of the purely abbreviate character, since it is possible that any formula might be expressed in words at length. We say possible, because it is barely so, not meaning thereby to imply that the mathematical sciences could ever have flourished under a system of expressions in words. A well-understood collection of notions, however extensive, becomes simple as a matter of conception by use and habit, and thus becomes a convenient resting-point for the mind and a suitable basis for new combinations of ideas. Now it is the characteristic of the advance of human knowledge that the mind never grapples at once with all that is contained in the notions under use for the time being, but only with some abstraction derived from a previous result, or some particular quality of that result. Hence no symbol which should contain the representative of every idea which occurred in the previous operations would ever be necessary; and more than this, it would even be pernicious from its complexity, as also from its suggesting details which are not required. That generalisation, or rather abstraction, which is the distinctive character of the civilised language as compared with the savage (though the latter is not wholly without it), must be the ruling process of mathematical notation, as it is of the advance of spoken language; and in this point of view the connection of our subject with speech presents more analogies and gives more instruction than its comparison with the written signs of speech. The latter is a bounded subject. When once it is agreed how the different modifications of sounds shall be represented, written language follows immediately; nor do the infinite modes of using words require any modification of the method of writing them. In our modern works, for instance, it would be difficult to find many artifices of notation with which to compare the never-ceasing va-

rieties of mathematical signs. In mentioning the marks of punctuation and reference, the italics for emphatic words, and the varieties of print by which notes are distinguished from text, &c., we have almost exhausted the list.

The greatest purposes of notation seem to be answered when the reader or learner can tell what is meant, first, with the utmost certainty, secondly, with sufficient facility; it being always understood that the second must be abandoned when it clashes with the first. Too much abbreviation may create confusion and doubt as to the meaning; too little may give the meaning with certainty, but not with more certainty than might have been more easily attained. Thus the old algebraists, in using A *quadratum* for A multiplied by A, in their transition from words at length to simple notation, used ten symbols where two only are requisite; and those who first adopted the symbol A A lost no certainty, and gained materially in simplicity. The successors of these again, who employed AA, AAA, AAAA, &c., to stand for the successive powers of A, were surpassed in the same manner by those who adopted A^2, A^3, A^4, &c. Beyond this it is obvious the notation cannot go in simplicity. The symbol which is to represent 'n As multiplied together' must suggest all three components of the preceding phrase—namely, n and A, and multiplied together. In A^n, the n and A are obvious, and the position of the letters is the symbol of multiplication; but, on the other hand, those who teach the beginner to signify by A^2 the square described on the line A purchase simplicity at the expense of certainty. The same mathematical phrase with them stands for two different things, connected indeed, but of more dangerous consequence from that very connection; for where similarities exist the reader should not be made to convert them into identities. It is of as much importance to impress the distinction of the things signified, as the analogy of their properties.

Certainty, then, and the greatest facility of obtaining it, seem to be the main points of good notation; and this is true with respect to the learner of all that has gone before. Grant that the mathematical sciences are never to advance farther, and many alterations might be made, and many new practices adopted, which would give facility in acquiring the past, without any introduction of obscurity. But the future must also be thought of; and no scheme will merit approbation which enlightens one end of the avenue at the expense of the other. Notation influences discovery by the suggestions which it makes; hence it is desirable that its suggestions should be as many, as plain, and as true, as it is possible. Here we are on quite a different ground: reason is the builder and settler, but imagination is the discoverer; and it might turn out that a notation which suggests many and obvious new ideas, though some of them should be fallacious, would be preferable in its consequences to another of less suggesting power, but more honest in its indications.

The following rules and cautions, with respect to notation, are drawn from observation of its present state.

1. Distinctions must be such only as are necessary, and they must be sufficient. For instance, in so simple a matter as the use of capitals or small letters, whatever may guide the inquirer to adopt either in one case should lead him to the same in another, unless some useful distinction can be made by the change.

The tendency to error is rather towards over-distinction than the contrary. It is surprising how little practice enables the beginner in mathematics to remember that so slight a difference as that of a and a' implies two totally different numbers, neither having any necessary connection with the other.

2. The simplicity of notative distinctions must bear some proportion to that of the real differences they are meant to represent.

3. Pictorial or descriptive notation is preferable to any other, when it can be obtained by simple symbols. Many instances occur in astronomy, and the use of the initial letters of words may be cited as a class of examples: as in f for force, v for velocity, &c.

4. Legitimate associations which have become permanent must not be destroyed, even to gain an advantage. The reason is, that the loss of facility in reading established works generally more than compensates for the advantage of the proposed notation; besides which, it seldom happens that the desired object absolutely requires an invasion of established forms.

5. Analogies should not be destroyed, unless false: for true analogy has been frequently the parent of *discovery*, and always of clearness.

6. False analogies should never be introduced; and, above all, the incorrect analogies which custom and idiom produce in language should not be perpetuated in notation. It is becoming rather common to make editions of Euclid which are called *symbolical*, and which supply signs in the place of many words. To this, if properly done, there cannot be any objection in point of correctness: nor can we take any serious exception to the use of □ AB to stand for the square on AB, to $\|^l$ for parallel, $<$ for angle, $\perp^r$ for perpendicular, &c. But when we come to AB.BC for the rectangle on AB and BC, AB^2 for the square on AB, we feel the case to be entirely altered.

7. Notation may be modified for mere work in a manner which cannot be admitted in the expression of results which are to be reflected upon. The mathematical inquirer must learn to substitute, for his own private and momentary use, abbreviations which could not be tolerated in the final expression of results.

8. In preparing mathematical writings for the press, some attention should be paid to the saving of room. In formulæ, which stand out from the text, this is not of so much consequence; but in the text itself a great deal of space is often lost.

The subject of mathematical printing has never been methodically treated, and many details are left to the compositor which should be attended to by the mathematician. Until some mathematician shall turn printer, or some printer mathematician, it is hardly to be hoped that this subject will be properly treated.

The writer who is most universally acknowledged to be a good guide in the matter of notation is Lagrange. This subject is of great importance; but fortunately it is pretty certain that no really bad symbol, or system of symbols, can permanently prevail. Mathematical language is, and always has been, in a state of gentle fermentation, which throws up and rejects all that cannot assimilate with the rest. A received system may check, but cannot ultimately hinder, discovery: the latter, when it comes, points out from what symbolic error it was so long in arriving, and suggests the proper remedy.

SYMMACHUS THE SAMARITAN, so called because he was a native of Samaria, and at first also of the Samaritan religion. He afterwards became a Jew, and then a Christian of the sect of the Ebionites. He probably lived under the emperor Septimius Severus, about A.D. 200.

Although subsequently to the Septuagint two other Greek translations of the Old Testament had been made by Aquila and Theodótion, Symmachus undertook the same task again. His translation differed in many points from those of his predecessors, but it was held in high esteem, and is often referred to by subsequent writers: it is especially praised for the perspicuity and elegance of the style. Symmachus himself published a second and improved edition of it. We only possess a few fragments of this translation, which are printed, together with those of Aquila and Theodotion, in the collections of Morinus Drusius and Montfaucon.

SYMMACHUS, QUINTUS AURELIUS, the son of L. Aurelius Avianus Symmachus, who in A.D. 365 was prefect of the city of Rome. He was instructed in rhetoric by a Gaul. In A.D. 370 he was proconsul of Africa, and fourteen years later, A.D. 384, he was prefect of the city, and in 391 consul with Tatianus. The time of his death is uncertain, though it is evident from his writings that he was alive in A.D. 404.

Symmachus was a man of ability and integrity, and during the difficult and dangerous situations into which he was thrown by the events of the time, he showed a degree of honesty and prudence which are rarely met with in the history of those times. He was one of the last great bulwarks of paganism, and exerted all his powers to prevent its overthrow, especially during the period of his prætorship of the city. We still possess an address of his to the emperors Valentinianus, Theodosius, and Arcadius (Symmach., 'Epist.' x. 61), in which he endeavours to persuade the emperors not to remove the altar of victory from the curia Romana. However his exertions were fruitless, and his address was refuted by St. Ambrose.

There is extant a collection of letters by him which was published by his son. The collection consists of ten books. Much care has evidently been spent upon the style, and, like all the letter-writers of that time, he took the letters of the younger Pliny as his model. The style is concise and animated, but is far from the natural and beautiful simplicity which characterises the letters written in the better period of Roman history. Yet the letters of Symmachus, especially those of the tenth book, which give a full account of the manner in which he discharged his duties as prefect of Rome, are of peculiar interest in regard to the history, constitution, and administration of the Roman Empire. Symmachus was also an orator. His orations are lost, with the exception of some fragments published by Mai and Peyron. There are many editions of the letters of Symmachus. One of the best is by C. Scioppius, Mainz, 1508, *4to*.

SYMMETRY, SYMMETRICAL (Mathematics). These terms are now applied to order and regularity of any kind, but this is not their mathematical meaning. Euclid first used the word 'summetros' (*σύμμετρος*) to signify *commensurable*, and this well-known Latin word is in fact merely the literal translation of the Greek: two magnitudes then were symmetrical which admitted of a common measure. In later times, and those comparatively recent, the word was adopted both in geometry and algebra in different senses.

Since symmetrical applies in its etymology to two magnitudes which can be measured together (by the same magnitude), the term would, as to space-magnitudes, naturally apply to those which may be made to coincide. But the term *equal* had occupied this ground; and when, in Euclid, the word equal, which was originally defined in the manner just expressed, had degenerated into signifying equality of area only, the term *similar* entered to express sameness of form, so that figures having perfect capability of coincidence, or the same both in size and form, were called equal and similar. The word symmetrical was therefore not wanted, and was finally introduced to signify that obvious relation of equal and similar figures which refers to their position merely, and consists in their corresponding portions being similarly placed on *different sides* of the same straight line; so that coincidence cannot be procured without turning one figure round that straight line. Suppose for instance the front of a building to be *symmetrical*: draw a vertical line through the middle of the elevation, and the two lateral portions are equal and similar, as Euclid uses those words. But they are more than equal and similar; they are symmetrical: the right-hand side stands in the right-hand portion of space, with respect to the dividing line, and in exactly the same manner as the left-hand side stands in the left-hand portion of space. If the architect were to preserve equality and similarity, without symmetry, he would make two left sides, or two right sides, to his building, but not one right and one left. In the letter W there is a want of symmetry, but not in O: to make W symmetrical both the inner lines should be thin, and both the outer ones thick.

Euclid assumes the power of turning a plane round, so as to apply the faces of two figures to one another, in such manner that, after the application, the spectator must be supposed to see through the paper or other imaginary substance of which his plane is the surface. He has then no occasion to consider symmetrically; that is, figures being equal and similar, no cases can arise in which it makes any difference of demonstration whether

they are symmetrical or not. When he comes to solid figures, he assumes a postulate in the garb of a definition, which dispenses him from the consideration of symmetry: namely, that solid figures consisting of the same number of equal planes, similarly placed, are equal. He seems to imagine that such solids must evidently be capable of being made to occupy the same space, which, though true as to quantity of space, is not true as to its disposition. Two solids may be equal in every respect, and yet it may be impossible (and precisely on account of their symmetry) to make one occupy the space previously occupied by the other. The two hands furnish an instance; they give the idea of equality (of size), similarity (of form), and symmetry (of disposition). Yet they cannot be made to occupy the same space, so as for instance to fit exactly the same glove; and a sculptor who should cast both hands from the same mould, would be detected immediately as having given his figure two right hands or two left hands. Again, suppose two solids, irregular pyramids for instance, composed of planes similar and equal, each of one to one of the other. Let coincidence be attempted geometrically: the two bases must of course be made to coincide. If then the two vertices fall on the same side of the common base, the figures will coincide altogether; but if the two vertices fall on opposite sides of the bases, absolute coincidence is impossible. Legendre proposed to call such solids by the name of *symmetrical*, in doing which he introduced the erm of common life in an appropriate manner.

In algebra, a function is said to be symmetrical with respect to any two letters when it would undergo no change if these letters were interchanged, or if each were made to take the place of the other.

SYMPATHETIC NERVES. [NERVE.]

SYMPHONY, or *Sinfonia*, signifies a musical composition for a full band of instruments, and, up to the latter part of the last century, the word was synonymous with *Overture;* but the modern symphony generally consists of four movements: a brilliant allegro, which is commonly preceded by a slow introduction; an expressive adagio or andante; a minuet with its trio; and a finale. Instead of the minuet, what is called a *Scherzo*, a short, animated, sportive movement, is sometimes substituted. But composers are not restricted by any rule regarding the number of movements. Mozart's second symphony in D has but three, besides the slow introduction; while Beethoven's Pastoral and Choral symphonies may be said to comprise six or more.

Symphony is a term also applied to the instrumental introductions, terminations, &c., of vocal compositions.

SYMPHORICARPOS, or SYMPHORIA, the name of a genus of plants belonging to the natural order *Caprifoliaceæ*. The species are natives of North and South America. *S. vulgaris*, common St. Peter'swort, is a native of Pennsylvania, the Carolinas, and Virginia, in sandy districts. It bears red cup-shaped berries, which are about the size of a hempseed, and ripen in winter. *S. racemosus*, Snow-Berry, is a native of North America, and grows on the banks of the Missouri, in Upper Canada, and on the north-west coast at Paget's and Nootka Sounds. This is a very handsome shrub, and was introduced into our gardens in 1817, since which time it has become very common. *S. occidentalis*, Wolf-Berry, Western St. Peter'swort, is a native of British North America, and is abundant about the Saskatchevan and Red River. *S. microphyllus* and *S. glaucescens*, the remaining species, are natives of Mexico.

SYMPHYTUM, the name of a genus of plants belonging to the natural order *Boraginaceæ*. *S. officinalis*, common Comfrey, is an inhabitant of the banks of rivers and streams and watery places throughout Europe. *S. tuberosum*, Tuberous-rooted Comfrey, is a native of Germany, Austria, France, Spain, and Italy. It has also been found in Scotland, near Edinburgh, and in Durham in England. Its flowers are of a yellowish-white colour, and appear in April and May. *S. asperrimum*, Rough Comfrey, is a native of the Caucasus, and grows on the banks of streams and rivulets. It is a tall plant, very rough, with handsome flowers, which are red before expansion, and afterwards blue. There are several other species.

SYMPLOCARPUS, a genus of plants belonging to the natural order *Araceæ*. *S. fœtidus*, Skunk-Weed or Skunk-Cabbage, emits an offensive odour; its tubers are acrid, but when dried and powdered are antispamodic. It is considered an excellent remedy in asthma, catarrh, and chronic coughs, and has also been employed in dropsy, rheumatism, and epilepsy.

SYMPLOCOS, the name of a genus of plants belonging to the natural order *Styraceæ*. Upwards of 30 species have been described. They all possess an astringent principle in their leaves, and some are used in dyeing. *S. Alstonia*, Alston's Symplocos, is the *Alstonia theæformis* of Linnæus, and was named after Charles Alston, professor of botany in the university of Edinburgh. It is a native of New Granada, near Santa Fé de Bogota, and Popayan. *S. tinctoria*, Dyer's Symplocos, Sweet-Leaf, Yellow-Leaf, is the *Hopea tinctoria* of Linnæus, and is a native of the Carolinas in the United States of America. *S. racemosa* is a native of Burdwan and Midnapore, in Bengal. It is used extensively by the natives as a dye, which is of a red colour. The nuts of *S. spicata* are very hard, and resemble a little fluted pitcher. This plant is a native of Silhet.

SYMPTOM (*σύμπτωμα*, an incident, or coincidence) is any change in the appearance or functions of the body different from those which occur in health, and perceptible to the senses either of the patient or his physician. Symptoms are best divided into the *essential*, which are peculiar to certain diseases, the *accidental*, produced by some circumstance of unusual occurrence, and the *common*, which are met with alike in various complaints.

That part of medicine which treats of symptoms is called Symptomatology. Semeiology is the name applied to the investigation of the signs of disease, and of their comparative value.

SYNAGOGUE, a word which primarily sig-

nifies any assembly or congregation, but came, like the word 'church,' to be applied, among the Jews, to places where any assemblies, especially those for the worship of God, met, or were convened. There is no trace of synagogues among the Israelites prior to the Babylonish captivity, nor, in express terms, until a long time after. It is collected however that the origin of such establishments may be referred to that period. Being then debarred from their customary religious observances, they were accustomed to assemble on the Sabbath-day, to hear portions of the law read and expounded; and those who ultimately returned from exile kept up this custom in Palestine. (Nehemiah, viii. 18.) These assemblies or meetings became in due time fixed to certain places, and a regular order was observed in them. The synagogues appear to have been originally erected outside the towns, in the fields, usually near waters, for the convenience of ablution; but they were soon introduced into the towns, and were usually on the most elevated spots. In large towns there were several, and the Jewish writers affirm that there were 480 in Jerusalem. The synagogues were used not only for worship, but for holding local courts of justice, which had cognisance of petty offences requiring no higher punishment than stripes, which were inflicted on the spot. (Matthew, x. 17; Luke, xii. 11; Acts, xxii. 19.) The affairs of the synagogue were under the direction of several officers: the chief of them was the archisynagogus or 'ruler of the synagogue,' who regulated its affairs, and without whose leave no one could read or preach. (Mark, v. 22; Luke, xiii. 14.)

With some necessary modification, the ancient usages are still maintained in the modern synagogues. The altar or desk is on a raised platform surrounded by a wooden rail, and large enough to contain several persons: the women do not mingle with the men, but have a separate part or gallery, where a wooden lattice screens them from observation. The men keep their heads covered in the synagogues.

There are seven or eight synagogues in London, and one in most of the seaport towns.

SYNALLAXIS, M. Vieillot's name for a genus of birds, placed by Mr. Swainson in the family of *Certhiadæ*.

Example, *Synallaxis garrulus*. Locality, Brazil. Mr. Swainson has given a very good figure of this bird under the name of *Malurus garrulus*, in the first series of his 'Zoological Illustrations.' It is remarkable, he observes, for its very singular nest, which is so large as to form a feature in the woodland scenery of Bahia, the only part of Brazil where he observed it. He describes the nest as built in low trees, formed externally of dried sticks, without any neatness, usually three or four feet long, and resembling at a distance a thick twist of bean-stalks thrown in the branches by accident. Sometimes, he says, two of these nests appear as if joined together, and there is an opening on the side, besides one at the top. He further states that the birds are generally seen near the nest, uttering a shrill, incessant, monotonous chirp, particularly in the morning and evening; adding (and we respect him for it), that he never could bring himself to tear one of these nests to pieces, merely for the purpose of seeing its construction.

Synallaxis garrulus.

SYNCELLUS, GEORGE (Γεώργιος Σύγκελλος), was a monk and abbot at the end of the eighth and the beginning of the ninth century after Christ. His surname was given him from his being the *Syncellus* of Tarasius, patriarch of Constantinople, who died in the year 806. George Syncellus died about the year 800.

His 'Chronography' (ἐκλογὴ χρονογραφίας) is a history of the world, arranged in chronological order, from the creation to the reign of Diocletian. The intention of the writer was to include the whole period down to 800 A.D. It is little more than a copy of the 'Chronicon' of Eusebius. It is contained in the Bonn collection of the Byzantine writers, in which it forms, with 'Nicephorus,' two volumes, edited by W. Dindorf, from two important MSS. at Paris, 1829. The Chronography of Syncellus was continued by Theophanes from 285 to 813 A.D.

SYNCOPATION, in Music, is when the first half of a note begins on the unaccented or weak part of a bar, and the other half is continued and terminates on the accented or strong part.

SY'NCOPE (συγκοπή, literally a cutting in pieces, a sudden failure of power or strength), *Fainting*, which is sudden impairment or complete loss of sensation and voluntary motion, with great diminution or almost total abolition of the heart's action and of the function of respiration.

The immediate cause of fainting is in all instances some interruption to the due transmission of blood to the brain. Various circumstances however, both moral and physical, interfere with the circulation, either through the medium of the nervous system, or by acting directly on the heart itself. Persons swoon from any violent and sudden moral emotion, as terror, grief, disappointment, or even excessive joy. The sight of blood or of any object which excites disgust occasions some persons to faint, as do various impressions on the senses, whether painful or otherwise. Very susceptible

individuals have been known to faint on perceiving the odour of certain flowers, and unpleasant smells still more frequently cause faintness. Long watching or over exertion, blows on the pit of the stomach, swinging, and rotatory motions, are some among many of the conditions which occasion fainting by their action on the nervous system. The abstraction of a large quantity of blood probably has a more immediate action on the heart; and to the disturbance of the circulation must be attributed those fainting fits which sometimes occur in the course of diseases of the heart. The sudden transition from a horizontal to a sitting posture when persons are very weak or have lost a large quantity of blood, probably acts in both ways at once; and fainting sometimes takes place from other causes, such as heated rooms, &c., of which we cannot well explain the action.

In the treatment of a person who has fainted, the first point is to place him in the recumbent posture; and in the case of fainting after bloodletting, nothing more is in general required. Exposure to the cool air, sprinkling cold water on the face, and friction of the limbs, may be employed if the fit continues; and a small quantity of æther or sal-volatile may be given as soon as the person can swallow. The horizontal posture should be preserved until recovery is complete.

SYNDA'CTYLES, or SYNDACTYLOUS BIRDS, a group comprehending those birds which have the external toe nearly as long as the middle one, and united to it as far as the penultimate articulation. This group contains the Bee-Eaters (*Merops*, Linn.), the Motmots (*Prionites*, Ill.), the King-Fishers (*Alcedo*, Linn.), the Todies (*Todus*, Linn.), and the Hornbills (*Buceros*, Linn.).

SYNDIC comes from the Greek 'sýndicos' (*σύνδικος*). The Greek word Sýndicos originally signified one who aided another in a matter before a court of justice, and hence it came to signify generally an advocate, one who maintained another's cause before a court of justice. The word had also other significations at Athens. The word Sýndicus passed into the Latin language. It often occurs in the 'Digest' in the sense of an attorney or agent for a universitas or corporate body: in this sense it is used as synonymous with Actor by Gaius. ('Dig.' 3, tit. 4, *s.* 1.) In the middle ages also the word Sýndicus was in common use, and was frequently given to the agent or factor appointed by corporate bodies to manage their common affairs, and especially to represent them in courts of law. The various other significations of the word may be traced in Ducange, Richelet, and other authorities.

SYNE'SIUS, a Christian philosopher of the school of the New Platonists, was born at Cyréne, in Africa, of a high family, in the year 378 A.D. He studied at Alexandria mathematics and philosophy under Hypatia, and at the same time poetry and eloquence. In his nineteenth year he was sent by his fellow-citizens, at the head of an embassy to Constantinople, to present a golden crown to the Emperor Arcadius, to whom he addressed a very suitable oration, which is still extant. He was soon after converted to Christianity, and baptized by Theóphilus, bishop of Alexandria. He became bishop of Ptolemais in the year 410. The time of his death is not known, but it was probably before 431.

Synesius was one of the most remarkable men of his age, though more eminent as a philosopher than as a Christian. His writings are in a pleasing style, sometimes rising to eloquence. His letters are of some historical value. With a peculiarly clear statement of philosophical opinions, he mingled interesting illustrations from the early historians, fabulists, and poets. A complete edition of the works of Synesius in Greek and Latin was published by Petau, Paris, 1612, folio, and has been frequently reprinted.

SYNGNATHA, according to Dr. Leach, the second order of the class *Myriapoda*, comprising the species of that class which were by Linnæus included under the head *Scolopendra*.

Dr. Leach divides the present order into two sections or families, to which he applies the names *Scolopendridæ* and *Geophilidæ*, which he characterises as follows:—the first (*Scolopendridæ*), by having each segment of the body provided with two legs, and the hinder legs distinctly longer than the others. To this family belongs the *Scolopendra forficata* of Linnæus, a species found commonly under stones, &c., in this country and other parts of Europe.

In the family *Geophilidæ* the legs are very numerous, and the hinder legs are not distinctly longer than the others. The species of the genus *Geophilus* (Leach) have upwards of forty legs, the antennæ have fourteen joints. Several species are found in England; they live in the ground and under stones. The *Scolopendra electrica* of Linnæus belongs to this genus.

SY'NOCHUS and SY'NOCHA, forms of fever recognised by most of the older and many recent writers on the practice of medicine.

SYNOD, a Greek word (literally, 'a coming together'), adopted by the Saxons, sometimes used for an assembly of any kind, but much more commonly for an assembly gathered for ecclesiastical purposes, and more particularly for an assembly of bishops or presbyters deputed by various churches or branches of the universal church to meet at an appointed place, there to deliberate on points of doctrine or other matters relating to the regulation and welfare of the church. These synods are also called councils. [COUNCILS.]

SYNODIC, SYNODIC REVOLUTION. The synodic revolution of two bodies which move round a common centre is that portion of one or more actual revolutions in which they go through all their possible relative positions. The simplest instance which can be given is that of the two hands of a watch: the absolute revolution of the minute hand is made in one hour, that of the hour hand in twelve hours; but the synodic revolution of the two hands is the interval which elapses between any time at which they are together and the next time at which the same thing takes place.

SYNONYME (*συνώνυμος*). It will appear from the following definition, by Aristotle ('Categ.,' *c.* i.), that this word was not used by him in the same sense in which it is used now: 'Those

words are Homonyma (ὁμώνυμα) in which only the name is common, but the definition (λόγος) of the substance (οὐσία) with reference to the name is different; for instance, we call "animal" both man and the painting of a man, in which cases only the name is common; but the definition of the thing with reference to the name is different; for if a man explains what is meant by each being "animal," he will give a separate definition for each: those words are synonymes (συνώνυμα) in which both the name is common, and the definition of the substance with reference to the name is the same; for instance, both man and ox are "animal" for both are called by a common name, and the definition of the substance is the same; for if a man gives a definition of each, what is meant by each being animal, he will give the same definition.'

At present the word synonyme is applied to different words, which mean, or are supposed to mean, the same thing: as valour, courage; virtue, goodness; vice, wickedness. Though words are often considered to be synonymous, it is probable that very few words in the same language really are synonymous. If we compare two languages, we may find synonymes; thus the words for man, horse, dog, &c., taken in any number of languages, may be considered synonymous. Words belonging to the same language may also be synonymous, where the language has received additions from various other languages, among which additions there may be terms which are synonymous (in the modern sense) with native terms of the language into which they are introduced. Thus in English there may be Saxon terms which are, or rather once were, synonymous with other terms which have been introduced into the English immediately from the Latin, or through the medium of the Italian and the French. It is said 'once were,' because though such words may have been synonymous originally, and introduced by writers for the sake of variety or harmony, or to avoid repetition of the same word, it rarely happens that such words continue to have their original meaning.

SYNO'VIA, or joint-oil, is the name applied to the fluid by which the joints of the bodies of animals are lubricated. It is separated from the blood which circulates in the vessels immediately surrounding the joint. Its quantity is in direct proportion to the size of the joint, and is always sufficient to keep the articular surfaces smooth and slippery, and to fill up those recesses in the joint into which the adjacent soft tissues do not exactly fit.

SY'NTHESIS (σὺν and θέσις, putting together). Synthesis teaches by construction; analysis by the undoing, as it were, the parts of a previous construction. If the construction of a watch were actually shown, and its capability to fulfil the object of the maker inferred from the consideration of the necessary connection of the parts (not merely proved by experiment from the going), this would be a synthetical explanation. But if, the actual performance of the machine having been first contemplated, its structure were then to be examined, by pulling it gradually to pieces, and properly inferring the effect of each removal, this would be an analytical examination.

We doubt very much whether pure analysis or pure synthesis exists in large quantities in an unmixed state in any science whatsoever.

In the exact sciences there is something like analysis, but much intermingled with synthetical processes. M. Charles ('Encyc. Méth.,' 'Synthèse') says there is hardly such a thing as analysis, properly so called, in mathematics; and, using the word analysis in the strict sense, we should agree with him, and add that, except for learners, there is as little of pure synthesis. Generalisation and abstraction, the application of that which has been found effective in the species to all other cases of the genus, and the separation of that which appears at first peculiar, but on further examination turns out to be only peculiar because a mode of thought capable of wide application has been incidentally mixed up with those which *are* essential to the problem in question, are two of the most powerful instruments of mathematics. But to which do these belong, to synthesis or to analysis? If every separation of ideas be analysis, the latter process may have that name; if every farther application of that which has once succeeded be synthesis, the former may be also. But the strict use of these terms would not allow of either extension; and if we be right in saying this, it unquestionably follows that pure analysis and synthesis, far from being the only instruments of the exact sciences, are not even the most prominent ones.

Under the general notion that all inquiry which proceeds in a reverse order is analysis, and that all which may be dignified by that name is sound mathematical reasoning, much fallacy has been introduced into the elements of mathematics, the effects of which are only beginning to disappear. The process is as follows:—assume a problem to be solved; proceed to separate the known from the unknown, or in any manner to make that which is unknown capable of being compared with the known; the result when obtained is the solution of the problem: such is the language held. But it was forgotten that the assumption of the possibility of solving the problem *was an assumption;* and that the conclusion should have been, not 'This is the solution of the problem,' but 'If the problem have a solution, it must be this.' To illustrate the faulty method by an example, suppose a beginner in algebra, with a competent knowledge of arithmetic, and without any absurd pre-definition of negative quantities, has the following question proposed: 'Given $3x-11=5x-15$; required the value of x.' He is told to proceed thus:—

$$\begin{aligned} &\textit{Let } 3x-11=5x-15 \\ &\text{Add } 15-3x \text{ to both sides } 15-11=5x-3x \\ &\qquad \text{or} \quad 4 \quad =2x \\ &\qquad \text{or} \quad 2 \quad = x \end{aligned}$$

Therefore $x=2$ is the value required.

Now the fact is, that the equation proposed is impossible to such a student: all that is proved is that *if* there be a solution, it is $x=2$; but when he is told to try whether $x=2$ is a solution, he finds $3\times2-11$ an operation which cannot be performed, at the first step.

As these blots are gradually removed, so does

the surface of the higher mathematics become more and more synthetical in all the elementary parts.

In the meanwhile there is a view of the higher mathematics, which will render the common term *analysis*, as applied to them, appropriate enough. The farther we proceed the greater is the power of taking out the reverse process in which analysis was defined to consist from the domain of the hypothetical syllogism, and placing it in that of rigorous deduction: the consequent increase of the power of pure analysis, or at least of that proceeding which most resembles it, may suggest the application of the term as descriptive at least of the ultimate tendency of all progress, though not of a result as yet entirely obtained.

SY'NTIPAS. This is the title of a collection of stories, written in Greek, and bearing the name of Michael Andreopúlus, but the collection is evidently translated from an Oriental work. The Eastern collections of moral stories are usually so told as to grow one out of the other, as we see in the 'Arabian Nights;' but there is a much better example in a work not so popularly known, the English translation of the fables commonly known as those of Pilpay. Many of our best European fictions, as well single stories as whole collections, may be traced from Europe to Arabia, and from Arabia to India, and the Indian form of the story or collection almost invariably bears the marks of an earlier origin than any other form, and appears to be, if not the original, at least the oldest surviving form. This fact, interesting in itself, becomes doubly so when taken in connection with the most recent philological discoveries, which have placed the *language* of India in much the same relation to the oldest known form of the German, as we have supposed the fictitious *literature* of India to hold to that of Europe. Many of the stories of Syntipas are found almost verbatim in an Arabic manuscript of the 'Arabian Nights,' in the British Museum, but the whole style of the stories points evidently to an Indian origin.

The Greek text of Syntipas was edited from two Paris MSS. by Boissonade: '*Συντίπας*. De Syntipa et Cyri filio Andreopuli Narratio,' Paris, 1828, 8vo. A translation of Syntipas into modern Greek appeared at Venice in 1805. Another work attributed to Syntipas was also translated into Greek from the Syriac by Andreopulus. It is a collection of sixty-two fables, jentitled *Παραδειγματικοὶ λόγοι*, and was edited by Matthiæ, Leipzig, 1781, 8vo.

SYPHAX. [NUMIDIA.]

SYRA, or SYROS (*Σύρα* or *Σύρος*), at present called *Siro*, is an island of the Ægean, which belongs to the group anciently called the Cyclades. It is south of Gyarus, and between Ceos and Tenos. Homer ('Od.,' xv. 402), who calls the island Syrie, places it above Ortygia, and says that it contained two towns. Its circumference, according to some of the ancient authorities, was 20,000 paces; and, according to Mucianus, 160,000 paces. (Plin., 'Hist Nat.,' iv. 22.) Homer and other Greek poets describe the island as rich in pastures, wine, and corn. There are still ruins of one of the ancient towns, and many valuable relics of antiquity have been discovered in this small island. Syra is intersected by hills and narrow valleys, and is well cultivated, though not fertile naturally. It belongs to the kingdom of Greece. The port of Syra, on the eastern coast, is convenient, safe, and deep, and has a very considerable trade. The population has increased of late years, and in 1842 was estimated at 25,000.

SYRACUSE (*Συράκουσαι*, in Greek; *Syracusæ*, in Latin; *Siracusa*, in Italian), a town on the east coast of Sicily, 30 miles S.S.E. from Catania, and about the same distance N. by E. from Cape Passaro, the southern extremity of Sicily. Ancient Syracuse, in the time of its splendour, was the largest city in Sicily, and one of the largest in the ancient world. It was of a triangular form, and consisted of five towns, adjoining one another, but separated by walls: the oldest of these towns was Ortygia on the peninsula, originally an island of an oblong shape, about two miles in circumference, lying between the Great Harbour on the west, which is a splendid piece of water about five miles in circumference, and the Little Harbour, which was paved with marble flags, on the east. On the other side of the Little Harbour was the town of Acradina, which extended for about three miles to the eastward along the sea-coast, until it reached a bay, where was the port Trógilus, outside of the city. The western part of Acradina, adjoining Ortygia, stood on low ground, on a level with the island; but the remaining and larger portion of it lay on a range of heights which stretch from the sea for several miles inland, and are divided from the lowland by a natural wall of rocks. North of Acradina, and inland, stood the town of Tyche, on the same range of heights as the upper part of Acradina, being divided from the latter only by a double wall and a way between. Tyche extended inland to the northward for a length of above two miles, and at its western extremity was the Epipolæ, consisting of several commanding heights, which were enclosed and made into a vast fortress by Dionysius the Elder. South-west of Tyche, in the lower ground at the foot of the heights, was Neápolis, or the New Town, which, at its southern end, adjoined the lower part of Acradina. The whole was surrounded by an external wall, the length of which was 180 stadia, or rather more than 22 miles. Ortygia was the first part inhabited; but the population increasing, the island was joined to the mainland by a causeway across the narrow channel of the sea, and the neighbouring low grounds were built upon. The tide of population still continuing to flow, the heights were occupied next, and Acradina became a large and handsome town. Tyche was occupied next, and lastly Neápolis or New City. Suburbs and gardens extended south of Neapolis to the mouth of the river Anápus, and beyond it, round the western shore of the Great Harbour to the steep peninsula of Plemmyrium, which faced Ortygia. After the Roman conquest the population, having gradually decreased, became restricted to the original Ortygia and the lower part of Acradina, and all the upper city was already abandoned in the time of Augustus. The Saracens in the ninth century plundered and devasted Syracuse, which

contained till then about 100,000 inhabitants; and from that time Ortygia, or the island, has been the only part inhabited.

The greater part of the upper town of Acradina, especially near the sea, is now a naked dreary rock, the surface having been thoroughly cleared of the materials of the ancient city. No traces of antiquity, except some steps and a few courses of stones, not a vestige of a house, temple, or monument, is to be seen on the extensive plain. The sea has undermined the shore, and the town-walls have fallen in and disappeared. Considerable remains of the external wall, built by Dionysius the Elder, are seen farther north round Tyche and the Epipolæ, beginning from Scala Græca near the port Trogilus, and following without interruption the sinuosities of the hill.

The remains of Syracuse are inconsiderable. Of the ancient theatre, which was hewn out of the rock, no superstructure remains. Not far from the theatre are the remains of an amphitheatre of the Roman period. The Latómiæ, or stone quarries, are excavated in the rocks which divide the upper from the lower town, and they furnished materials for the building of the ancient city. They are from 60 to 80 feet deep.

The catacombs are vast excavations of remote antiquity, which have been used for burying the dead. The aqueduct which supplied the ancient city with water was begun by Gelon, who was tyrant of Syracuse at the time of the Persian invasion of Greece under Xerxes, B.C. 480. Outside of the walls and on the left bank of the Anapus near the Great Harbour, are parts of the shafts of two fluted columns of the temple of Jupiter Olympius.

The modern town of Siracusa, which, since the devastation of the Saracens in the ninth century, has been confined to the peninsula of Ortygia, is fortified, and has a regular garrison, but is commanded by the height of Acradina. It is a bishop's see; has 13,000 inhabitants, narrow streets, numerous churches and convents, and other public buildings, the most remarkable of which is the cathedral, once the temple of Minerva, which was plundered of its ornaments by Verres. Its exterior dimensions are 185 feet in length and 75 in width. It has been repeatedly repaired, and a new façade erected in very bad taste. There are also some remains of Diana's temple near St. Paul's church.

The celebrated fountain of Arethusa is a large pool of water, supplied by a spring, and separated from the sea by a wall, in the Ortygia, near the Great Harbour; and about 80 yards from it rises from the bottom of the harbour a copious spring, called l'Occhio della Zilica.

There is a museum at Siracusa containing the statues of the Landolina Venus and Æsculapius, some sarcophagi, a handsome collection of vases, inscriptions, coins, &c., and a public library. The principal private cabinets are those of Landolina and Capodieci.

Syracuse enjoys a delightful climate in winter, but the alluvial plain on the west side of the harbour, through which flows the Anapus, exhales pestilential miasmata in the summer months. The surrounding country is very fertile. On the left bank of the Anapus is the fountain of Cyane, now called the Pisma: it is a circular basin of the purest water, about 60 or 70 feet in diameter, and 26 feet deep, stocked with fine fish. From it the water flows in a quiet deep stream to the river Anapus: on the sides of the stream is found the Cyperus Papyrus floating in abundance.

Many of the women of Syracuse, especially of the lower orders, are remarkable for the Grecian contour of their features. The people carry on some little trade by sea, but the place is by no means thriving.

History of Syracuse.—About 735 B.C., one year after the foundation of Naxos by a colony of Chalcidians, Archias, a Corinthian, the head of a colony of Corinthians and Dorians, settled in the island of Ortygia, having overpowered the native Siculi. This settlement, which afterwards extended to the mainland, was the origin of the great city of Syracuse. The epochs of the foundation of the four suburbs on the mainlaind, which became gradually so many large towns, are not known. Syracuse also sent colonies to other parts of Sicily, which founded Acræ, Cásmena, and Camarína. The first two centuries of the internal history of Syracuse are very obscure. The power at first was in the hands of the 'geómori,' or 'gámori,' the original colonists who had taken possession of the land. Their estates were cultivated by slaves or serfs, called kyllyrii or killikyrii, who were the native Siculi reduced to bondage at the conquest. Fresh colonists coming in from other places formed the Demus, or popular body, which was excluded from the body politic. The demus however having increased in numbers and wealth, claimed to participate in the offices and honours of the state; but about 492 B.C., the demus being joined by the kyllyrii, effected a revolution and expelled the geomori or aristocracy. The democratic government that followed was one of confusion, and did not last long, for Gelon, tyrant of Gela, having taken the part of the exiled geomori, marched to Syracuse with an army, and the people willingly opened the gates to him, when he was acknowledged as tyrannos, or sovereign, of Syracuse, 485 B.C. The rule of Gelon was temperate, and his reign was prosperous for Syracuse. [GELON.] Gelon was succeeded by his brother Hieron [HIERON I.]; and Hieron by his brother Thrasybúlus, B.C. 467, who was more tyrannical than his brother, and was driven out after one year's reign. Syracuse was now freed from her tyrannical rulers, and a new constitution was formed, but the city was disturbed by factions, and many of the more distinguished citizens withdrew from public life, and the power was in the hands of the poorer classes.

In B.C. 416 a quarrel between the towns of Egesta and Selinus brought in the Syracusans, who took the part of Selinus. The people of Egesta applied for aid to Athens, which sent to Sicily a formidable armament, B.C. 415. This expedition, which was directed against Syracuse, was a total failure. Of 40,000 men who were engaged in it, nearly all were killed or taken prisoners, and not a single vessel returned.

After the defeat of the Athenians Diocles proposed in the assembly of the citizens, that as all had shared in the common danger and defence, all should share alike the offices of the state, and moreover that public offices should be filled, not by election, but by lot, a measure which was adopted. Diocles at the same time compiled a criminal code of a very severe kind. This democratic condition lasted very few years, for in 406 B.C. Dionysius, a clever demagogue, was elected commander, and soon become tyrant of Syracuse. The events of his long reign, including his wars against Carthage, are narrated under DIONYSIUS THE ELDER. He was succeeded by his son, who was finally expelled by Timoleon from Corinth. [DIONYSIUS THE YOUNGER.] Timoleon established a government of mixed democracy and aristocracy. After Timoleon's death, B.C. 337, there was a period of twenty years marked by no very important events, till B.C. 317, when Agathocles by violence and treachery usurped the supreme power in Syracuse.

This adventurer is said to have been the son of a potter, and to have worked at his father's trade. His first step in life was by marrying a rich widow of Syracuse. After he had obtained the supreme power he did not assume the state or title of king, but he ruled with absolute power. He aimed at the dominion of the whole of Sicily, and he succeeded in reducing all the people of the island, except the subjects of Carthage. His wars with the Carthaginians, and his struggles to maintain his power, in which he scrupled at no act of villainy, occupied all his time. He did nothing, so far as is recorded, for the permanent prosperity of Syracuse. He died at the age of seventy-two, after holding his power for twenty-eight years.

After the death of Agathocles, B.C. 289, Syracuse recovered its independence, but being distracted by factions, the people chose, in 275, for their prætor, Hieron, who was a descendant of King Gelon, and after five years more he was made king. His very long and upon the whole happy reign is narrated under HIERON II. He died B.C. 216. His son, HIERONYMUS, did not inherit his abilities; he quarrelled with Rome, which had become the preponderating power in Sicily, and although he was murdered shortly after, his policy was persevered in, and a Roman army, under Marcellus, laid siege to Syracuse, and took it in 212 B.C. Here ends the history of Syracuse as a state. From that time it was merely a town of the Roman province of Sicily.

SYRACUSE. [NEW YORK.]

SY'RIA is the present European name of a country in Asia, which is situated along the eastern shores of the Mediterranean, and is a province of the Turkish Empire. The name of Syria is not now known to the Asiatics, though some of their historians call it Souristan, or Soristan, which means the country of Souria, or Syria. The name Syria (Συρία) occurs in the Greek writers, whence it passed into the Latin language. The name by which it is at present known to the Asiatics is that of Belad el Sham, or 'the country to the left.' The Mohammedans of Mecca direct their face to the rising sun when they pray, and then Syria is to their left, and Belad el Yemen, or Yamen (the country to the right), is on the other hand.

Syria extends from 29° 45′ to 37° 25′ N. lat., and between 34° 10′ and 38° 45′ E. long. The boundaries are well marked towards the north, where it is formed by that portion of Mount Taurus which at present goes by the name of Alma Dagh (the ancient Amanus), and towards the west, where it is washed by the Mediterranean Sea; the boundaries are ill-defined towards the south and east, where Syria is contiguous to deserts, inhabited by nomadic tribes, who sometimes acknowledge the authority of the Turkish sultan, but more frequently disregard his orders and those of his governors. The situation of Syria is peculiar. It is an isthmus which separates a sea of water and a sea of sand; for on the west is the Mediterranean, while on the east is a sandy desert which extends to the Persian Gulf. The isthmus reaches southward to the Red Sea. The form of the surface is no less peculiar. The central part is furrowed by a longitudinal depression, or wide valley, which extends from its most southern point, the Bahr Akabah, to the base of the Alma Dagh, where it terminates with the lake of Bohhaire (36° 45′ N. lat.). This long valley, which extends over more than seven degrees of latitude, is divided in the middle (between 33° 15′ and 33° 25′) into two valleys by a high narrow ridge of mountains, the Jebel Arbel; and this ridge also divides the waters which run southward from those which run westward and northward. Thus the great valley is divided into two valleys, of which the southern is traversed by the river Jordan, and is far below the level of the sea; while the northern is drained by the rivers Liettani (Leontes) and Aazy (Orontes).

Physical Description.—Syria may conveniently be described in three sections, *Southern*, *Central*, and *Northern*.

Southern Syria extends from the southern boundary of the country to 33° N. lat., or, more precisely, to the Bahr el Houle, or lake Merom (33° 10′ N. lat.), and comprehends the southern valley and the countries contiguous to it on the west and east.

The Southern Longitudinal Valley extends from the most northern point of the gulf called Bahr Akabah to the Bahr el Houle, more than 250 miles in a straight line, and is naturally divided into three sections by two deep depressions, which are occupied by two large lakes. In the southern depression is the Dead Sea, called by the natives Bahr Lut; and in the northern the lake of Gennesareth, now called Bahr el Tabarieh. The southern part of the valley, or that which lies between the Bahr el Akabah and the Dead Sea, is called Wady el Arabah; the central portion, between the Dead Sea and the Bahr el Tabarieh, Wady el Ghaur, or El Ghor; and the northern, or that part of it which extends from the Bahr el Tabarieh to the Bahr el Houle, is called Wady Seissaban.

The Wady el Arabah extends from S. to N. in a straight line for above 110 miles. The existence of this valley was unknown in Europe

till the publication of Burckhardt's travels in 1822. On each side of the Wady el Arabah the mountains rise to a great elevation, and form a boundary to a long valley varying from 8 to 20 miles wide. About three miles from the Bahr Akabah the soil is strongly impregnated with salt, but farther north sand prevails, and is intermixed with pieces of granite, porphyry, and greenstone. After the rains the country produces some grasses, and supplies indifferent pasture for sheep, goats, and camels; but in several places low hills of moving sand occur, which are destitute of vegetation. Near 31° N. lat. the general level of the Wady el Arabah descends abruptly about 150 feet, forming apparently a line of hills running east and west, and composed mostly of marl. All along the base of these hills there are springs of brackish water, which form a tract of marshy land towards the north. Between this salt marsh and the Dead Sea extends the most desolate portion of the Arabah. No trace of vegetation, no living creature, is met with.

The Dead Sea occupies the greater portion of the valley between 31° 10′ and 31° 50′ N. lat. It is described under PALESTINE.

The Ghor or Ghaur, or that portion of the Southern Valley which lies between the Dead Sea on the south and the lake of Tabarieh on the north, extends about 65 miles in a straight line. The width of the valley is about six miles; but towards the Dead Sea it grows much wider. It is traversed by the river Jordan, which is here called Sheriat Kebir. [PALESTINE.]

The Bahr el Tabarieh, formerly called the Lake of Tiberias and of Gennesareth, occupies about 12 miles of the extent of the valley in length, and about half as much in width. It is mostly surrounded with steep and lofty mountains; but there is a narrow strip of plain near the lake which is very fertile. The Wady Seissaban, or northern portion of the Southern Valley, extends from the northern extremity of the Bahr el Tabarieh to the southern banks of the Bahr el Houle, about 15 miles in a straight line. Perhaps one-half of its extent is below the sea-level.

The desert called El Tyh Beni Israël (The Wandering of the Children of Israel) belongs partly to Syria and partly to Egypt, as the boundary-line between these two countries lies across it. The Tyh is a desert and elevated table-land, whose level above the sea has not been determined, but is estimated at between 1000 and 2000 feet. Along its eastern border its surface is much furrowed by deep watercourses or wadys; in some parts lower depressions occur. It has only a few fertile spots. The table-land of Judæa joins El Tyh on the north, and extends from the parallel of the southern extremity of the Dead Sea to 32° 30′ N. lat., having on the east the Dead Sea and the Ghaur, and on the west the plain of Falastin. The dividing line between the last-mentioned plain and the table-land is near 35° E. long. The elevation of this table-land diminishes as we proceed farther north. [JERUSALEM; PALESTINE]. On the west of the table-land of Judæa is the Plain of Falastin, as the ancient country of the Philistines is still called by the Beduins. Its length is about 150 miles, but its width varies from 10 to 120 miles. It is bounded on the west by the Mediterranean. The southern half of this plain is sandy and sterile; but the northern is more fertile. Mount Carmel is one of the principal objects in this plain; in its narrow acceptation this name is given to a mountain about 1500 feet high, but in a more extended sense it applies to a whole range about 12 miles in length. Between Carmel and the north-east corner of the table-land of Judæa, which comes close up to the lake of Tabarieh, extends the plain of Mèrj Ebn Omer, or Amer, the ancient plain of Esdraelon; it is about 15 miles long, and from 5 to 15 wide, and in the middle rises the round isolated summit of Jebel Tor or Tabor. Northward of this plain extends the Hilly Region of Galilæa, which is the most fertile part of Southern Syria. Along the Mediterranean extends the Plain of Akka (Acre), which begins on the south at the base of Jebel Carmel, and extends northward to Ras el Abiad, or the White Cape, a distance of more than 20 miles.

The most southern part of Syria is occupied by the extensive table-land of Petræa, which contains the mountain-regions of Shera and Belka, which enclose the Wady el Arabah, the Dead Sea, and the Ghaur on the east, and also an extensive plain lying east of these regions, and continuing in that direction to the Desert of Arabia. The mountain-region of Shera extends from Jebel Hesma to the river Modjeb, from 29° 40′ to 31° 30′ N. lat., between the Hadji road on the east and the Wady el Arabah on the west, and occupies about 20 miles in width; it consists of many ridges running in various directions, and traversed by valleys which afford pasturage, corn, and fruits to a few Beduin tribes. The mountain-region of the Belka extends from the river Modjeb on the south to that of Zerka on the north, or from 31° 30′ to 32° 20′ N. lat. Its width between the Dead Sea and the Ghaur on the west, and the Hadji road on the east, rather exceeds 40 miles. The chief part of the district has but little fertility; there is however an extensive mountain-mass, whose highest point is called Jebel Gelaal (Gilead), which is almost entirely covered with high trees; oak, wild pistachio-trees, and many others not known in Europe; in scenery it resembles a European country; it has numerous springs and small rivers; and it is a favourite location for the Beduins.

The Beled Haouran is to the east of the Ghaur. Along the valley it extends from 32° 21′ to 32° 45′ N. lat.; but where it borders on the Syrian desert, which lies between it and the valley of the Euphrates, it advances as far north as 33° N. lat. It consists of two mountain-regions, the Jebel Ajeloun on the west, and the Jebel Haouran on the east, and a plain which lies between the mountain-regions. Both mountain-regions contain numerous rugged peaks, with few cultivable spots. The plain has numerous small villages; but the Beduins have chief control over the district. East of the Jebel Haouran is the Syrian desert.

Central Syria extends from 33° 10′ to 34° 40′ N. lat. It comprehends the most elevated portion

of the country. Within its limits are the two mountain-ranges of the Libanus and Antilibanus, and the southern and highest portion of the northern valley. To the east of the Antilibanus is the elevated plain of Damascus. Mount Libanus constitutes a continuous range of mountains, which begins on the south at the castle called Kalaat el Shkif, south of 33° 20′ N. lat., and, running to the east of north, terminates near 34° 40′ with a ridge of hills called Jebel Shara. The highest part of it occurs between 34° 10′ and 34° 15′ N. lat., and is called Jebel Makmel; it rises to more than 12,000 feet above the sea-level, and is covered with snow all the year round. On both sides of the range a terrace occurs somewhat about the middle of its height, which divides the Upper and Lower Libanus; the Upper Libanus is a lofty region, with few trees; but the Lower Libanus, to the west of the range, is one of the most interesting countries in Asia. It is a continuous series of hills and deep valleys, which present a great variety of productions. The eastern declivity of Mount Libanus differs greatly from the western, exhibiting rugged peaks and deep ravines.

The Northern Valley, as far as it is included within Central Syria, extends along the eastern base of Mount Libanus in all its extent, or about 90 miles in length, with a width of from 2 to 10 miles. It is drained by the two rivers Leontes and Orontes, the former flowing southward, and the latter northward. The most elevated part of the valley is near the centre, where Baalbec is situated. Northward of Baalbec is the northern half of the valley, called Belad Baalbec, sterile and uninteresting, while southward is the Belka, a very fruitful valley.

The Antilibanus, which stands to the east of the valley just noticed, extends much farther to the south than the Libanus. It is divided into two portions by a long and narrow depression across the mountains, which occurs near 33° 40′ N. lat., and is called El Bogaz (the Gorge). The southern portion is much better known than the northern; and the mountains are more richly clothed with forests.

The Plains of Damascus lie on the eastern side of the Antilibanus, surround its southern ridge, the Jebel Heish, and extend as far south as the Haouran. They form an intermediate terrace between the mountain-region and the low Syrian desert, which is farther east, and is much lower than the plains. The lowest part of these plains is about 12 or 15 miles east of Damascus, where an extensive lake, or rather swamp, occurs, called Bahr el Merdj, in which several rivers are lost which descend from the eastern declivity of the Antilibanus, and from the Jebel Haouran, from north, west, and south. These rivers before they enter the lake give to the environs of Damascus a fertility scarcely equalled in any other country. The most western portion of the plain, or that which extends between the southern extremity of the Jebel Heish and the Jebel Ajeloun, and from the lake of Tabarieh eastwards to the Hadji road, is called the Plain of Jalon; it has for the most part an undulating surface. The plains extending east of the Hadji road, south of El Gutha, are rather hilly in the northern districts, short and low ridges running in different directions; the southern districts contain two extensive rocky regions, called El Szaffa and El Ledja, which are divided from one another by a wide valley, called El Lowa. The part of the Plains of Damascus which lies north of the Gutha is only known where it is contiguous to the road running from Damascus to Aleppo; it contains many fertile spots, but is not much cultivated.

Northern Syria comprehends that portion of the country which lies north of 34° 40′ N. lat. It differs in physical constitution from the more southern parts. A high mountain-range runs along the shores of the Mediterranean, and in some places close to them. At the back of it is the northern portion of the Northern Valley, which is divided by a hilly tract, extending from south to north, from the Eastern Plains. The mountain-region is divided into two portions by the lower course of the river Aazy. The southern part, which comprehends about two-thirds of the whole, is known by the name of Jebel el Anzeyry, and the northern by that of Jebel Ahmar; the former of these spreads out to a width of 20 miles, with a general elevation of about 6000 feet; but the Jebel Ahmar never exceeds 5 miles in width. Both ranges have very steep declivities.

The northern portion of the Northern Valley begins at the termination of Mount Libanus (34° 43′ N. lat.) and Mount Antilibanus (34° 20′ N. lat.). North of these places a level country extends across the whole breadth of Syria, from the Mediterranean to the Euphrates, which is only interrupted in the eastern plains by ranges of low hills. The plain contiguous to the river Aazy and to the caravan-road leading from Damascus to Hems presents only a few gentle ascents and descents, except along the river, where the descent to its bottom appears to be continuous. The chief rivers of this plain are the Aazy or Orontes, and the Labweh. At one part of the plain is a deep depression, which receives all the rivers that descend from the mountains surrounding it on the east, north, and west, and form an extensive lake, called El Bohhaire, the ancient lake of Antiochia. It is about 12 miles long and 6 miles wide, and noted for its eels, which form an article of commerce. There are many spots of great beauty in this northern plain.

The Hilly Region, which extends to the east of the valley of the Aazy and of the El Umk, from the town of Hamah to the base of the Alma Dagh, varies from 10 to 20 miles in width; the hills are not very lofty, but their sides are fertile. The Eastern Plains occupy about two-thirds of the surface of Northern Syria, and extend from the Hilly Region to the banks of the Euphrates. They are divided into two parts by a ridge of low hills, called Jebel Allahhs, or Elahas. This ridge is near 35° 50′ N. lat., and appears to extend from the hills north-west of Hamah to the vicinity of the Euphrates. The ridge, as well as the southern half of the plain, are little known. The northern half is traversed by three rivers, two of which rise on the southern declivity of Alma Dagh, and run southward; these are the Sajur and the

Kunik; the third river is the Zeheb. The Zeheb, after a course of about 40 miles, falls into a salt lake called El Sabkh, which is surrounded by low rocky hills. The lake is about six miles long and two wide. After the rains it inundates the narrow strip of land which, in summer, lies between its banks and the rocks, and when the water has been evaporated by the heat of the summer, this narrow strip is covered with pure salt, in some places two inches thick. This salt is collected in the month of August, and extensively used over a great part of Syria.

The Alma Dagh constitutes a portion of that extensive mountain-range which the ancient geographers called Taurus. The Alma Dagh is the ancient Amanus. It lies along the boundary of Syria and Anatolia or Asia Minor, and its crest is considered as the boundary between these two countries. The range occupies in width about 30 miles, of which the larger portion belongs to Anatolia. The mountains are very precipitous, and can only be traversed by beasts of burden in a few places. The most frequented road runs from Aleppo due north to Aintab, and thence over the Alma Dagh to Kaisariyeh and Angora.

Climate.—Syria, though situated within the temperate zone, exhibits all the climates of the globe, from that of the equator to that of the snowy region. Syria is subject to very violent earthquakes. In 1837 the southern districts were laid waste by a very violent earthquake, by which several towns were destroyed. At other times the northern districts have suffered. In the country surrounding the Dead Sea there are many traces of volcanic action. Hot-springs occur in numerous places, and in others there are depressions which have the appearance of craters. Hot scorching winds are frequent in the sandy regions. The rainy seasons depend on the elevation of the different regions.

Productions.—Wheat and barley are the principal kinds of grain which are cultivated, except in those parts which have too arid a soil, where dhurra is almost exclusively grown. Spelt is much cultivated in the southern district, but very little oats, and no rye. Rice is only cultivated on the banks of the Bahr El Houle and in the Wady Seissaboun. The most common pulse are peas, lentils, and the Egyptian Bean. There are also artichokes, melons, water-melons, cucumbers, and pumpkins. Potatoes are only cultivated in some valleys of Mount Libanus, and capsicum in the southern districts. Cotton, hemp, flax, madder, indigo, and tobacco, are to some extent cultivated. Almost all the fruits both of temperate and of tropical climates are met with in Syria. The forests on the mountains consist of cedars, firs, and pines; those of the table-lands include the oak, walnut, laurel, juniper, scammony, and sumach.

The domestic animals which Syria has in common with England are horses, cattle, asses, sheep, and goats. Camels are found everywhere, even on Mount Libanus, on pastures which are more than 6000 feet above the sea. Beasts of prey are not numerous, with the exception of jackals, foxes, and hyænas, which are frequent in some parts of the desert mountains. There are bears on Mount Libanus and Antilibanus. Wolves are only found in the forests of Alma Dagh. Wild boars are very numerous in many parts. Deer are met with on the Alma Dagh and near Mount Tor; and in the desert parts are several kinds of antelopes.

There are no metals found in Syria except iron, which is worked in the Kesrouan in Mar Hanna, west of Beirout, where also coal has been discovered of late years. In the Tyh Beni Israël, and at the southern extremity of the Dead Sea, there are mountains almost entirely composed of rock salt. Bitumen is collected on the western shores of the Dead Sea. In the northern Ghaur pieces of native sulphur are found at a small depth beneath the surface.

Inhabitants.—The population of Syria consists of agricultural and nomadic tribes. Nearly all the Fellahs, as the agricultural population of Syria is called, belong to one race, resembling in the structure of their body the Beduin Arabs, and speaking also the Arabic language. The Fellahs however are divided, according to their religion, into Christians, Jews, and Turks. Under the last name all the Mohammedans are comprehended. The Maronites, who have joined the Greek Latin church, constitute a peculiar sect [MARONITES]. There are also three religious sects in Syria, which are neither Christians nor Mohammedans, the Druses, Anzeyrys or Nossaïries, and the Ismaulies. The most powerful of them are the Druses [DRUSES]. The Anzeyries, or Nossaïries, inhabit the mountain-region which has received its name from them, and which lies between the lower course of the Aazy and the Mediterranean. They are an industrious people. The Ismaulies are few in number, and inhabit some villages in the mountains of the Anzeyry. They are considered to be a remnant of the Assassins and Ismaelites. [ASSASSINS; ISMAELITES.]

There is hardly any tract of considerable extent in Syria without nomadic people on it. This is the effect of the character of the country, in which two districts are generally found contiguous to one another, one of which affords pasture in winter and is barren in summer, while the other yields pasture in summer, and cannot be pastured with advantage in winter. This obliges those who have large herds or flocks to a continual change of abode; but such a system is ruinous to agriculture. There appears to be at present only one tribe of Beduins in Syria who never cultivate the ground, but who live exclusively on the produce of their herds of camels, sheep, and goats. This is the Aeneze, who wander about in the Syrian and Arabian deserts, from 28° to 36° N. lat., and pass the winter there; while they pass the summer within the limits of Syria. The other Arabian tribes generally cultivate some small part of the district in which they wander about with their herds. The principal of these tribes are only nominally dependent on the Turkish governor, and though they pay a small tribute, they levy much larger sums on the agricultural inhabitants of these countries.

The Turkmans and the Kurds are in almost exclusive possession of the elevated range of the Alma Dagh and the tracts at its base. The

eastern districts of these mountains are occupied by the Kurds, and the western by the Turkmans. The Turkmans belong to the great Turkish race of Central Asia; while the Kurds are evidently a tribe who emigrated from the table-land of Kurdistan. The Turkmans carry on many branches of manufacture in Syria; but the Kurds are mostly shepherds and agriculturists.

Political Divisions and Towns.—Syria is divided into four eyalets, or pashaliks, two of which, Akka and Tarablous, extend over the countries on the shores of the Mediterranean as far north as 35° 55′ N. lat.; the third, Aleppo, occupies the most northern part, from the Mediterranean to the banks of the river Euphrates, and as far south as 35° 45′; and the fourth, Damascus, the interior of the country south of 35° 45′.

1. *The Eyalet of Akka*, better known in Europe by the name of *St. Jean d'Acre*, to which the eyalet of Gaza was added at the beginning of this century, occupies the whole coast from the boundary-line of Egypt to the Bay of Junie, or Kesrouan (35° 55′ N. lat.), and extends over the plain of Falastin, Mount Carmel, the plain of Ibn Omer, the hilly region of Galilee, the plain of Akka, and the Bekaa and Belad Baalbec. The following are the chief towns:—*Gaza* [Gaza]. *Jaffa*, or *Joppa*, a town of 4000 inhabitants, is built on a conical eminence overhanging the sea, and is surrounded on the land side with a wall, in which there are towers at unequal intervals. It has no commerce, but is the common landing-place of the pilgrims who go to Jerusalem. *Ramleh*, or *Ramah*, lies in a fertile and well-cultivated plain: it has 15,000 inhabitants, who derive some advantages from the road from Joppa to Jerusalem. *Kaïsariyeh* (*Cæsarea*) had formerly a harbour, which at present is filled up with sand: it was once a large town, as the extensive ruins still prove, but it is now nearly uninhabited. *Tantura* has a harbour for small boats, and carries on some commerce with Egypt, from which it receives rice and linens: it exports cattle and fruits. *Kaïfa*, or *Haïfa*, is a small place built on a bay formed by Cape Carmel, but the bay has little depth of water, and admits only boats. *Akka*, or *St. Jean d'Acre* [Acre]. *Tsur*, or *Sur*, the ancient *Tyrus*, is built on an isthmus about 400 feet wide, which is supposed to have been formed by the embankment that Alexander the Great made for the purpose of taking the ancient town, the site of which is now uninhabited. The population amounts to 3000 individuals, most of whom gain their livelihood by fishing and agriculture. *Zaïda*, or *Zeïdeh*, the ancient *Sidon*, is built on rising ground which overhangs the sea. The streets are for the most part narrow. The present harbour admits only boats. The town has between 7000 and 8000 inhabitants, and several dyeing-houses: large quantities of silk are exported. *Beïrut*, or *Beirout* [Beirut]. *Nazareth*, or *Nazarah*, is built in a beautiful valley which opens into the plain of Ibn Omer, and is in one of the most fertile and best cultivated districts of Galilee. It has about 2000 inhabitants. *Tabarieh*, the ancient *Tiberias*, is on the banks of the Bahr el Tabarieh, on a small plain, surrounded by mountains. Towards the land it is enclosed by a thick and well-built wall. It contains about 4000 inhabitants, who have some commerce with the Beduins of the Ghaur, and of the country north-west of the town. This place was nearly levelled to the ground by the earthquake of 1837. *Szafed* is a neatly-built town, situated round a hill, on the top of which is a Saracenic castle. It contains 600 houses, several olive plantations and vineyards, and a few manufactures. *Zahle* contains from 800 to 900 houses, and is almost exclusively inhabited by Christians, who make much cotton cloth and some woollen stuffs. They have 20 dyeing-houses, and a considerable trade with the Beduins of the Bekaa. *Baalbec* [Baalbec]. *Deir el Kamr*, the capital of the emir of the Druses, south-east of Beirut, in a valley of Mount Libanus, is a considerable place.

2. The *Eyalet of Tarablous*, the smallest of the political sections of Syria, extends along the sea-coast from the Bay of Junie to Cape Possidi, about 12 miles south of the mouth of the river Aazy, and comprehends the northern and more elevated portion of Mount Libanus, the plain separating this mountain from the Jebel Anzeyry, and the largest portion of the last-mentioned range. The chief towns are as follow:—*Meinet Berdja*, *Jebail*, and *Batroun*, are small ports on the Mediterranean. *Tarablous*, the ancient *Tripolis*, called by the Arabs *Tarábolos*, one of the most commercial places of Syria, is built on the declivity of the lowest hills of Mount Libanus, and is divided by a river, called Nahr Kadish, into two parts, of which the southern is the more considerable. The town is well built, and is much embellished by gardens, which are not only attached to the houses in the town, but cover the whole triangular plain between the town and the sea. The town is supplied with excellent water by an aqueduct, which crosses the river upon arches. It has a population of between 15,000 and 18,000 individuals, and some large manufactures of soap for exportation. The harbour is convenient, and accommodates much shipping. *Latakieh*, called by the natives *Ladekive*, the ancient *Laodicea*, stands on the northern edge of an elevated tongue of land, called Cape Ziaret, which advances nearly two miles beyond the general line of coast. The houses stand partly in the midst of gardens and plantations, and most of them have flat roofs. The port, called Scala or Marina, is about half a mile from the town, and separated from it by gardens and plantations. *Jebili* is a small town on the sea-coast. In Mount Libanus is *Kanobin*, a convent, the seat of the patriarch of the Maronites. In its vicinity are the famous cedars of Lebanon (Mount Libanus).

3. The *Eyalet of Haleb*, or *Aleppo*, contains the northern part of the Jebel Anzeyry, the valley of the lower Aazy, together with the Ghab, the Jebel Amar, the Umk, the Hilly Region of Northern Syria, and the Northern Plain. The chief towns are as follow:—*Scanderoon*, or *Iskenderoon* [Scanderoon]. *Sweïdiyah* is the name of a large village and a harbour. *Haleb*, or *Aleppo*

[HALEB]. *Antiocheia, Antakia,* or *Antioch* [ANTIOCHEIA]. *Edlip* contains more than 1000 houses, some manufactures of cotton stuffs, a few dyeing-houses, and a large manufacture of soap. *Ain-tab* [AIN-TAB].

4. The *Eyalet of Damascus,* or *Sham,* extends over the southern of the two great plains which occupy the north-eastern portion of Syria, over the plains of Damascus, the southern portion of Mount Antilibanus, the greater part of the Wadys Seissaban and El Ghaur, the table-land of Judæa, the Haouran, and the mountain-regions of the Belka and the Shera. It contains many important towns. *Jerusalem* [JERUSALEM]. *Nablous,* the *Sichem* of the Bible, and the *Flavia Neapolis* of the Romans, is a town of considerable extent, and well built. It is situated in a valley, which is covered with plantations of fruit-trees, and is a thriving place. *Khalil,* the *Hebron* of the Bible, and one of the holy cities of the Jews, is south of Jerusalem, not far from the place where the table-land of Judæa joins the desert of El Tyh. It contains about 3000 inhabitants, and has some glass-houses. *Hamah,* the ancient *Epiphania,* lies on both sides of the river Orontes, and is partly built on the declivity of a hill and partly on a plain. It contains between 30,000 and 40,000 inhabitants, among whom are many rich Turkish families. Though the houses make no great show, they are well arranged and furnished. There are four bridges over the river. *Hems,* the ancient *Emesa,* contains a population of between 25,000 and 30,000 individuals, and several manufactures. To the south-east of this town, at the distance of nearly 100 miles, are the ruins of Palmyra, or Tadmor. [PALMYRA.] *Hasbeya* is built on the top of a mountain, and is a thriving place, with 700 houses, and manufactures of cotton-cloth for shirts and gowns, and a few dyeing-houses. Near it are pits of the Bitumen Judaicum. In the plains of Damascus there is only *Damascus,* or *Sham.* [DAMASCUS.]

In the mountain-region east of the Jordan are the towns of *Szalt,* a small republic of about 500 families; *Kerek,* with 600 families; *Tafyle,* with 600 houses, in a fruitful valley; and *Maan,* with about 100 houses. West of Maan, in the Wady Musa, near the great Wady el Arabah, are the ruins of PETRA.

Manufactures and Commerce.—Syria is the most manufacturing country in Western Asia. With the exception of hardware and cutlery, there is hardly any manufactured article imported into Syria; but a great variety of goods which are made in Syria are exported to Egypt and Anatolia, and still greater quantities go to the countries farther east, and find their way into Persia, where they meet the articles brought from Hindustan. The most manufacturing town is Damascus. The Phœnicians were probably supplied from Damascus with a great number of manufactured articles for the market of the countries that surround the Mediterranean, and they supplied the manufactures of Damascus with some of the materials used in them. The extent of the manufacturing industry of this town may be conceived from the statement of Schubert, that above 40,000 persons are employed in making silk stuffs, especially satin and silk damasks and brocades; and that caravans frequently go from Damascus to Haleb, which take no other goods but articles of this description. The varieties of manufactures at Damascus are almost countless. Those of Aleppo are considerably smaller, and are mostly limited to cotton and silk stuffs, and gold and silver lace. Some branches of manufacturing industry are carried on in most of the small towns, and even in some villages, such as cotton stuffs for gowns and shirts, the dyeing of cotton, mostly blue and red, tanning leather, and making soap. Such places however supply only the neighbourhood, and the Beduins who resort to them for such articles, and they rarely if ever work for a distant market.

The commercial intercourse between Syria and Europe is very small. None of the agricultural products of Europe are in demand in Syria; no kind of grain is imported, with the exception of rice, with which Syria is supplied from Egypt. The manufactured goods of Europe are not in demand, not being adapted to the taste and customs of the East. The only article which is imported to a certain extent is hardware, which is almost exclusively supplied by England: some French cloth is also imported. The chief articles sent from Europe to Syria are supplied by the East and West Indies, and consist of indigo, cochineal, and coffee. The chief exports from Syria to Europe are silk, galls, olive-oil, sponges, fruit, and tobacco. The commerce between Syria and the countries to the east and north of it is very extensive, and is concentrated at Aleppo. Two well-frequented roads lead from Aleppo to Constantinople through Anatolia; and two likewise extend from Aleppo to Persia, which divide at Orfa in Mesopotamia. But the most frequented caravan-road between Aleppo and Bagdad lies to the west of the Euphrates, passing by Annah and Hit.

History.—*Syria* (ἡ Συρία) was the Greek and Roman name for that country of Asia which forms the whole or a part of the district called Aram in the Bible, the Arabian name of which is *Sham,* and the European *Syria.* The etymology of the name is very uncertain. In its widest extent Syria included all the country to the west of the Euphrates, as far south as Egypt and Arabia; on the north and west it embraced the greater part of Cilicia, Cappadocia, and Pontus, its boundaries on this side being the river Halys and the Euxine Sea.

In the usual application of the word, Syria was the district bounded by the range of Amánus on the north, by the Mediterranean on the W., by the Euphrates and the Arabian Desert on the E. and S., and by the 'river of Egypt' (probably the river El-Arish) on the S.W. In a still narrower sense it sometimes denoted the same district, with the exception of Phœnicia and Palestine. Herodotus, in speaking of Palestine, includes it in Syria, as a subordinate division: he calls it 'the Palestine Syria' (ii. 106).

The Syrians (not including the inhabitants of Phœnicia and Palestine under the name) derived

their descent from Adam, the youngest son of Seth (Gen., x. 22).

History of Syria to the Death of Alexander the Great.—The earliest records of the state of Syria represent it as consisting of a number of independent kingdoms. The conquests of David (B.C. 1055, &c.) brought these states into subjection to the kingdom of Israel; but they again became independent at the close of Solomon's reign (B.C. 975). From this time the kingdom of Damascus especially is frequently mentioned in connection with the history of the Ismelites, and it appears gradually to have grown in power, and to have held supremacy over the other states of Syria (1 Kings, xx. 1), and even to have given the kings of Israel great trouble, till the reign of Joash (B.C. 845), who obtained considerable successes against Benhadad (2 Kings, xiii. 22–25). The last king of Damascus was Rezin, who having engaged with Pekin, king of Israel, in war against Ahaz, king of Judah, Ahaz invited Tiglath-Pileser, king of Assyria, to attack Damascus, which he took, and carried the inhabitants captive to Kir (2 Kings, xvi. 1–9) about the year 740 B.C. From this time Syria formed a part of the Assyrian, Babylonian, Persian, and Macedonian Empires in succession, but during this whole period, down to the death of Alexander the Great (B.C. 323), its history presents nothing worthy of notice.

Syria under the Seleucidæ, down to its subjection to Rome.—After the battle of Ipsus (B.C. 301), Syria, with the exception at first of Cœle-Syria and Palestine, fell to the share of Seleucus Nicátor, and henceforth it became the central portion of the kingdom of the Seleucidæ, the usual abode of the kings being at its capital, Antioch. [SELEUCIDÆ.] The empire of the Seleucidæ was destroyed, and Syria was declared a Roman province by Cn. Pompeius, 65 B.C. During the civil wars of Rome, Syria suffered much from the conflicts of the two parties, the native robbers, and the incursions of Parthians, and it was not till the reign of Augustus that it became quietly settled as a part of the Roman Empire. It was governed by a proconsul, who commonly resided at Antioch. In the year 6 A.D., upon the banishment of Archeláus, Judæa and Samaria were added to the province of Syria, to which they henceforth belonged, with a short interruption during the reign of Herod Agrippa I.

Under the Macedonian kings Syria was divided into four parts (tetrarchies), which were named after their capitals, Antioch, Seleuceia, Apaméa, and Laodicéa. Both the Greeks and the Romans called the northern portion of Syria, that is, the whole country with the exception of Cœle-Syria, Phœnice, and Palestine, by the name of Upper Syria, to distinguish it from Cœle-Syria, that is, the Hollow Syria, which was the name given to the valley between the ridges of Líbanus and Anti-Líbanus. Under the Romans the province was divided into nine districts: Cassiótis, Apaméne, Chalcídice, Seleucis, Pieria, Commagéne, Cyrrhéstice, Chalybonítis, Palmyrene.

Diocletian extended the boundaries of Cœle-Syria, and added it to Phœnice, under the name of Phœnicia Libanensis. Constantine the Great erected Commagene and Chalybonitis into a new province under the name of Euphratensis, and Theodosius II. divided the remainder of Syria into Prima and Secunda. Antioch was the capital of the former, and Apamea of the latter.

History of Syria under the later Roman Emperors.—Under the Cæsars Syria was one of the most flourishing and luxurious provinces of the Empire. It had a considerable commerce, and formed the emporium which connected the eastern and western parts of the world. Hadrian, upon his accession (117 A.D.), fixed the eastern boundary of the Empire at the Euphrates. The province was overrun, and almost subdued by Sapor (A.D. 258), from whom it was rescued by Odenáthus (261–264). [PALMYRA.]

In the reign of Phocas, the Persian Chosroes II. crossed the Euphrates, reduced Hierápolis, Chalcis, and Berœa, and finally Antioch, which he almost destroyed (A.D. 611). Heraclius, who had obtained the Empire in 610, took the field in 622 against Chosroes who had in the meantime conquered not only Syria, but also Palestine (614), and had overrun Egypt and Asia Minor (616). Heraclius repeatedly defeated Chosroes, and at last drove him beyond the Tigris (A.D. 627), and Siroes, his son (and by the murder of his father, his successor), made a treaty of peace with Heraclius (A.D. 628).

Conquest of Syria by the Saracens.—The history of this period is related by Gibbon, in the 51st chapter of his 'Decline and Fall.' His account should be compared with the notes in Milman's edition of that work, and especially with Price's 'Chronological Retrospect of Mohammedan History.' Mohammed himself had taken a few towns of Syria (630 A.D.), and his successor, Abu Bekr, had scarcely mounted the throne when he summoned the Arabian tribes to the invasion of Syria (A.D. 632). A large army marched into Syria under the nominal command of Abu Obeydah, but virtually led by the fierce Khaled, 'the sword of Allah.' They first attacked Bosra, on the east of the Jordan, which was betrayed by the governor Romanus. They then laid siege to Damascus (A.D. 633). The defence was obstinate, and in the meantime Heraclius had assembled an army of 70,000 men at Emesa, under the command of his general, Vardan. The armies met at Aiznadin, the Greeks were utterly routed, and the Arabs returned to the siege of Damascus, which fell, after an obstinate resistance, in 634 A.D., about July or August. The conquest of the country was carried on by the reduction of Heliópolis, Emesa, and other important towns. In the meanwhile Heraclius had prepared for a last effort in defence of Syria. An army of 80,000 men brought from the different provinces of the Empire, with a light-armed force of 60,000 Christian Arabs, encountered the Mohammedans on the banks of the river Yermuk; but few Christians escaped from the field of battle (A.D. 634). The sacred character of Jerusalem procured for it an honourable capitulation (637 A.D.). Aleppo submitted, and Antioch purchased its safety for 300,000 pieces of gold (A.D. 638).

In the same year Heraclius fled from Antioch to Constantinople, and the province was abandoned to the Saracens.

Syria under the Khalifs.—Under the Ummeyahs, or Ommaiades, the seat of government was at Damascus, whither it was removed from Kufa by Moawiya, who reigned from 656 to 679, but it lost this distinction in 749, when the Abbasides took up their residence at Bagdad.

For more than nine centuries the history of Syria has been to a great extent included under that of Egypt. It was subjected with Egypt to the Turkish usurper Ahmed Ebn e' Tooloon, who founded the dynasty of the Tooloonides, which lasted from 868 to 906 A.D., when the Khalif Moktafee recovered both countries; and afterwards to another Turkish usurper, Akshed Mohammed Ebn Tughg (A.D. 936), whose dynasty lasted till 970; when Moez, a successor of Mahdee, conquered Egypt, and soon afterwards Syria, as far as Damascus, and founded the dynasty of the Fatimite caliphs, whose capital was at Cairo. In 1076 the Turks invaded Syria and Palestine, took Damascus and Jerusalem, and established an independent kingdom under the princes of the house of Ortok. The Caliph Mostali retook Jerusalem in 1096, but lost it again, with a large portion of Syria, in the first crusade, at the close of which the Christian kingdom of Jerusalem was established, which included the ancient Palestine and a tract of country round Antioch. This kingdom lasted from 1099, the year in which the crusaders took Jerusalem, to 1187, when Salah-ed-Deen (Saladin) recovered it. His dynasty, the Eyoobites, lasted till 1250, when it was destroyed in Egypt and Damascus by the revolt of the Baharite Memlooks. Seif-ed-Deen, the Sultan of Aleppo, great-grandson of Salah-ed-Deen, recovered Damascus, but he was overthrown and slain in an invasion of the Moguls from Persia in 1260.

Syria continued subject first to the Baharite and then to the Circassian Memlooks till the overthrow of the latter by the Turks in 1516–17. Their possession of the country was however interrupted for a short time by Timur, or Tamerlane, who invaded Syria and sacked Aleppo in 1400, and in the next year destroyed Damascus. He did not however attempt to keep possession of the country.

Syria under the Turks.—In the year 1516 Syria was conquered and united to the Ottoman Empire by the Sultan Selim I. It is still under the power of the Porte.

In the later history of Syria there is nothing worthy of notice till its invasion by Bonaparte, A.D. 1799.

In the year 1831 Mehemet Ali, the viceroy of Egypt, took up arms against the Porte on the pretext of a dispute with the pasha of Damascus. His son, Ibrahim Pasha, invaded Syria, and took Gaza in October, and on the 9th of December attacked Acre. After in vain issuing a firman, commanding Mehemet to withdraw his forces from Syria, the sultan declared war against him (April 15, 1832). In the meantime Ibrahim took Acre on the 21st of May, and Damascus on the 13th of June. On the 7th of July he defeated the army of the sultan at Hems, took Antioch on the 1st of August, and on the 21st of December utterly routed the forces of the sultan at Kôniah in Anatolia, and pressed on for Constantinople. In the meantime the sultan claimed the help of Russia, which prepared to act against Mehemet Ali by sea and land. France and England now exerted themselves to guard against the preponderance of Russian influence, and at length a peace was concluded, and the sultan, by a firman issued on the 6th of May, 1833, confirmed Mehemet in his government of Egypt and Candia, granting to him in addition that of Damascus, Tripoli, Said, Safed, Naplous, and Jerusalem, and on the 9th orders were sent by the viceroy to Ibrahim to repass the Taurus. Mehemet did not however renounce his project. After many indecisive movements on both sides, and of fruitless negociations between the two parties and the great European powers, matters were brought to a crisis by the renewal of hostilities in Syria, in May, 1839, followed by the defeat of the Turkish forces by Ibrahim at Nezib (June 25), and the desertion of the Turkish fleet to Mehemet Ali on the 4th of July. On the 16th Mehemet announced to the new sultan Abd-ul-Medjid his determination to assert his claim to the hereditary government of all the provinces under his command, as a reply to the sultan's offer of the hereditary government of Egypt. The five powers of England, France, Austria, Prussia, and Russia, now induced the Porte to take no further steps without their advice. The negociations which followed ended in the secession of France, and the conclusion of a treaty between the remaining four powers and Turkey, to compel the submission of Mehemet. The treaty was signed in London, on the 15th of July, 1840. In pursuance of this treaty a fleet consisting of English, Austrian, and Turkish vessels, commenced operations on the coast of Syria by the storming of Beirout. Acre and Sidon shared the same fate shortly afterwards, and after much negociation, Mehemet consented to give up Syria, and received from the sultan the hereditary government of Egypt (January 11, 1841).

SYRIAC LANGUAGE. The Syriac, or Western Aramaic, is a language of the Semitic family, and was spoken by the inhabitants of Syria and Mesopotamia, and, after the Captivity, in Galilee. It differs very little from the Chaldee, or Eastern Aramaic. The two dialects differ chiefly in their systems of vowel points and in the use of a different character.

Under the Seleúcidæ, the Syriac was, in all public transactions, and to a great extent in common use, supplanted by the Greek, but even to this day it is sometimes heard in Syria. A mixture of the two dialects of the Aramaic formed the common language of Palestine in the time of Christ, and hence we find in the New Testament many idioms and some words of the Syriac.

The principal, as it is also the most ancient work in the Syriac language, is the Peshito, or old Syriac version of the Bible.

The principal Syriac grammars and lexicons are

the following:—Schaaf, 'Opus Aramæum,' 1686; C. B. Michaelis, 'Syriasmus,' 1741; J. D. Michaelis, 'Grammatica Syriaca,' 1784; Jahn, 'Elementa Aramaicæ Linguæ,' 1820; Yeates, 'Syriac Grammar,' 1821; Dr. F. Nolan, 'Introduction to the Syriac Language,' 1821. The best grammar is Hoffmann's 'Grammaticæ Syriacæ Libri iii.,' 1827. There are lexicons by Trostius, Gutbirius, Schaaf, and Zanolini.

SYRINGA, the name of a genus of plants belonging to the natural order *Oleaceæ*. *S. vulgaris*, the common Lilac, known by its ovate heart-shaped pointed leaves. It is now one of the commonest ornaments of our shrubberies, blossoming, together with the laburnum, in May. It is one of the few shrubs that resists the injurious influence of the smoke of cities, and flourishes in great perfection in some of the squares of London. *S. Josikea*, Josikas Lilac, is a native of Transylvania, and was discovered by the Baroness von Josika, after whom it was named by Jacquin. It attains the height of six or eight feet, and has broad leaves. It grows in damp shady places near water. Though very dissimilar in appearance to the common lilac, it has been suspected to be only a variety of that species. It is not yet very common in our nurseries. *S. Persica*, the Persian Lilac. Of this species three varieties are found in the nurseries, the white, the cut-leaved, and the sage-leaved Persian lilacs.

All the lilacs will grow in almost any kind of common soil; the best way of propagating them is by the suckers which they send off in so great abundance. They may be grafted on privet or ash stocks, and in this way the inconvenience of their great produce of suckers may be got rid of.

Syringa is also the name that is commonly but improperly given to the species of *Philadelphus*, or Mock-Orange. The name *Syringa* was given to the lilac on account of its stems being used for the manufacture of Turkish pipes. The stems of the *Philadelphus coronarius* are also used for the same purpose, and equally with the lilac it had the name of Pipe-Privet, or Pipe-Tree, given it when first introduced into this country, and afterwards the name Syringa.

SYRINGE, a portable hydraulic instrument of the pump kind, commonly employed for the forcible ejection of fluids. In its simplest form it consists of a cylindrical tube, with a perforated nozzle at one end, and a piston or plunger, to the rod of which a ring or other convenient handle is attached. The tube being held in the left hand, with its nozzle immersed in water, the piston is drawn to the upper end of the tube by the right hand. The pressure of the atmosphere upon the surface of the water causes it to follow the piston, so that the syringe becomes filled with water. The instrument is then removed from the vessel of water, and, by pushing the piston back towards the nozzle, its contents may be ejected with a force proportionate to the power applied to the piston. Syringes of various sorts are extensively used for surgical, horticultural, and other purposes. The fire-engine, the garden-engine, the air-pump, and the stomach-pump, are all examples of syringes.

SYRINGO'DEA, a genus of plants belonging to the natural order *Ericaceæ*. This genus was formed by David Don out of the old genus *Erica*. The species, of which 112 are described by George Don in Miller's Dictionary, are all natives of the Cape of Good Hope.

SY'RPHIDÆ, a family of dipterous insects of the section *Brachystoma* of Macquart.

This family contains upwards of forty genera, a great portion of which have representatives in our island. The species frequent flowers and woods; the larvæ of the species of *Syrphus* are in the form of an elongated cone; they affix themselves, &c., with a kind of glue, and feed exclusively on aphides. Some of the *Syrphidæ* inhabit the nests of the humble-bees (*Bombus*), and these so much resemble the species of Bombi, that they might at a first glance be mistaken for them. Other *Syrphidæ* live in the larva state in water and mud; and these larvæ are provided with a long slender tail, through which they respire, it being raised to the surface of the water or mud for the purpose.

SYRTES (αἱ Σύρτεις) was the name given by the Greeks and Romans to the two gulfs on the northern coast of Africa, one of which they called Syrtis Major, and the other Syrtis Minor. Both Syrtes were the terror of the ancient mariners. The name is said to be derived from the Greek verb σύρω (*draw* or *drag*), from their drawing in ships and swallowing them up in their sandy shoals. Another derivation is from the Arabic word *sert* (sand), which is at this day applied to the district on the shores of the Syrtes.

The Greater Syrtis, now called the Gulf of Sidra, is a large bay on the northern coast of Tripoli, lying between the promontories of Boreum (Ras Teyonas) on the east, and Cephalae (Ras Kharra) on the west, the distance between which is 230 geographical miles: its greatest depth is about 110 geographical miles. The Sahara, or Great Desert, here comes down almost to the sea, leaving here and there only a narrow slip of land, which is not habitable. The gulf is very shallow and full of quicksands, and the coast is covered by a chain of little islands.

The Lesser Syrtis, now called the Gulf of Khabs, on the southern corner of Tunis, lies between the promontory of Brachodes, or Caput Vada (Ras Kapondiah), on the N., and the island Meninx (Jerbah) on the S. This gulf is said by Scylax to be even more dangerous than the Greater Syrtis. Its dangers arise however not so much from quicksands, as from 'the variations and uncertainty of the tides on a flat shelvy coast.' (Rennell.)

SYRUPS are medicinal solutions of sugar, either in water alone, as in simple syrup, or in liquids charged with some peculiar principle of an active kind, such as senna or buckthorn, or merely grateful from its colour or fragrance, or both, such as syrup of violets. These must be of a proper consistence, either by having a suitable quantity of sugar added to the water first, or by subsequent evaporation of the superfluous water. The former is the preferable mode, as the syrup keeps better. The purest and most thoroughly refined sugar should be employed, and generally in the proportion of two parts of sugar to one of fluid.

SYRUS, PUBLIUS. [PUBLIUS SYRUS.]

SYRZAM. [SIMBERSK.]

SYSTEM (Mathematics), a word little used: we hear sometimes of a system of equations, or a system of curves or surfaces; the former meaning a set of equations which are related to each other in the same problem, the latter a class of curves or surfaces which are connected by any law.

SYSTEM (Astronomy). This term is applied to every theory of the disposition and internal arrangements of the solar system, or of the material creation generally. Thus we have the system of Ptolemæus, of Copernicus, &c. Perhaps a short description of the distinctive characters of the different systems may be useful in a work of reference.

Ptolemaic.—The earth is an absolutely fixed centre, and the planets revolve in circles about centres which themselves revolve round the earth.

Copernican.—The sun is a centre, round which the planets revolve. Some of the machinery of the Ptolemaic system is retained.

Tychonic.—The sun is a centre of motion to all the planets, which revolve round it, while the sun and planetary orbits are carried together round the earth as a fixed centre.

Semi-Tychonic.—The sun is a centre of motion to Mercury and Venus, as in the Tychonic, and the motions of the other planets are as in the Ptolemaic system.

Newtonian.—There is no fixed centre, the sun only approximating to that character from its greater magnitude. The orbits of the planets are approximately represented by ellipses, exactly by ellipses of which the elements vary.

The Newtonian system is frequently called Copernican, from its rejecting what Copernicus rejected; but it is far from receiving all that Copernicus received. The introduction of the ellipse is due to Kepler. We have not included the system of Des Cartes, because it has reference to physical causes, and contains no peculiarity of arrangement.

The term system is also applied to the subdivisions of the solar system: thus we have the Terrestrial, Jovial, Saturnian, Uranian, Neptunian systems.

SYSTEM, in the musical language of the Greeks, had the same signification as the word *Scale* has in modern music.

SYZYGIES and QUADRATURES. The Syzygies of a planet or of the moon are those points of its orbit at which it is in conjunction or opposition with the sun: the Quadratures are the precisely intermediate positions. Thus at new and full moon the moon is in syzygies; at half moon in quadratures.

SYZY'GIUM, a large tropical genus of plants of the natural family of *Myrtaceæ*. Of the species, *S. Guineense*, a native of the coast of Guinea and Senegal, has been employed as a remedy in rheumatism. *S. Jambolanum* is a native of the East Indies, and is there most extensively diffused, being planted near villages in clumps of trees, chiefly on account of its fruit, which is sometimes called Java Plum by Europeans, but Jamoon by the natives.

SZATHMAR. [HUNGARY.]

SZEGEDIN, the capital of the Hungarian county Czongrad, is situated on an eminence on the right bank of the Theiss, opposite its junction with the Maros. The city is surrounded with circular fortifications. It is divided into the city called Palenka, which has well-built houses, but unpaved streets; the citadel, which is surrounded with walls and moats, and includes some barracks; the Upper and the Lower Suburbs; and a street called Kukurntz-Varos, or the corn-market. The whole contains 32,200 inhabitants, of whom about 750 are Jews. There are six Catholic churches, a Greek church, and a synagogue. Among the principal public buildings are the county-hall, the house of correction, the town-house, and the great salt-magazine. There are a gymnasium, a high school, several hospitals, a military school, a workhouse, and a theatre. The trade of Szegedin is considerable; the chief articles are salt from Transylvania, tobacco and corn from the Banat, timber and wooden wares from Transylvania, horned cattle, hops, and wool. The most important industrial products are snuff, soda, and soap. More than 40,000 cwts. of cotton from Turkey pass annually through the town to Pesth and Vienna. The wine made in the neighbourhood is good, but will not keep. Szegedin in the time of Matthias Corvinus was one of the most important cities in Hungary. It was taken by the Turks under Soliman II. after the battle of Mohacs, August 26, 1526, and remained in their possession till 1686, when it was retaken by the Austrians soon after the defeat of the Turkish army by Sobieski under the walls of Vienna. The city was the seat of the insurgent government in July, 1849; it was taken, Aug. 3 of that year, by the Austrians under Marshal Haynau, on their advance against the insurgent army at Temeswar.

T is the thin letter of the dental or palato-dental series.

1. *T* is interchangeable with *c*, as Lat. *nuc* (*nux*), Eng. *nut*. [See C.] The resemblance of these letters in Latin manuscripts is so close that it is often difficult to distinguish them. Hence there is much uncertainty in the orthography of many words in that language. Yet there is no doubt that *contio*, an abbreviation of *conventio* [See N], and *nuntius* or *nountios*, of *novi-ven-tius* (compare *nov-i-tius*), should be preferred to the forms *concio*, *nuncius*.

2. *T* interchangeable with *d*. [See D.]

3. *T* interchangeable with *th*, whether as pronounced in *thin* or in *the*. Thus the Latin *t* corresponds for the most part to *th* in English, as *tu*, *tres*, *tenuis*, *pater*, *mater*, of the Latin language, severally correspond to *thou*, *three*, *thin*, *father*, *mother*, of the English. The termination of the third person in the Latin and old English verbs presents the same analogy, as *amat*, *loveth*.

4. *T*, or *pt*, interchangeable with *p*. [See P.]

5. *T* interchangeable with *s*. [See S.]

6. *T* interchangeable with *st*. This interchange might be inferred from the preceding. Examples exist in *art*, *wilt*, *shalt*, compared with the usual termination of the English second person.

7. *T* interchangeable with *l*. Thus the Latin words *lingua* (also *dingua*), *lacr-uma*, (also *dacr-uma*), *lacerare*, *ligare* (also *dicare*), severally appear in English as *tongue*, *tear* (subst.), *tear* (verb), *tie*. Hence ἤπιος is allied to the Latin *alter*, and *mitis* of the Latin to *mild* in English. Compare also the Latin *ali-quod*, &c., with the German *et-was*, &c. [See L.]

8. *T* interchangeable with *nd*. This change is perhaps not common. Examples are, Lat. *et*, Germ. *und*, Eng. *and*; Lat. *sed* or *set*, Germ. *sond-ern*, Eng. *sund-er*, *sund-ry*, &c.

9. *T* disappears from the beginning of words before *l*. [See L.]

10. *T* in the middle of words, when flanked by vowels, often disappears. Thus the Latin words *pater*, *satis*, *vita*, *amatus*, *amata*, reappear in French as *père*, *sez* (in the compound *as-sez*, from *ad-satis*), *vie*, *aimé*, *aimée*.

11. *T* at the end of words is frequently dropped. Of the omission of a final *t* in pronunciation, the French language has numerous examples, as in *et*, *fait*, *est*, &c. It is very probable that a final *t* has in this way disappeared from the third person singular of many tenses in the French verb, as *il aime*, *il aimera*, *qu'il finisse*, &c. In the interrogative form *aime-t-il*, the interposed *t* really belongs to the verb, and owes its preservation in this form to the fact that a vowel follows. Even the Greek language drops this *t* in the suffix of the third person, as in τυπτει, ετυπτε, for τυπτετι, ετυπτετι. Compare the middle forms τυπτεται, ετυπτετο.

12. *Ti* before a vowel is often changed to a sibilant represented by *s*, *sh*, *ch*, &c. Thus from the Latin *faction* (*factio*) are derived the French *façon* and the English *fashion*. So *avaritia*, *malitia*, *vitium*, became in French and English *avarice*, *malice*, *vice*.

TABARCA, TA'BRACA (*Thabargah*), a small island near the north coast of Africa, at the mouth of the river Zain, the ancient Tusca, on the left bank of which was the ancient town of Tabarca. The island was formerly held by the Genoese, who once derived considerable advantage from the coral fisheries there, and built a fort upon it to protect their settlement. But when the profits of the coral fishery decreased, the Genoese left the island to the dey of Tunis, who in 1830 ceded it to the French. The harbour is good, and much frequented by the coral-fishers.

TABASCO. [Mexico.]

TABERNACLE, THE, was a sacred building, partaking of the nature of a tent, which was set up by the Israelites in the wilderness for the worship of God, and carried with them in their journeys. It was made under the direction of Moses, in exact conformity to a pattern shown to him by God when on Mount Sinai. The east end, at which was the entrance, was covered by a curtain of fine linen, and across the interior of the tabernacle, at the distance of two-thirds of its length from the entrance, was another vail, which divided the tabernacle into two chambers, of which the outer and larger was called the Holy Place, the inner the Most Holy, or the Holy of Holies. The tabernacle was surrounded by a large court, called 'the court of the tabernacle.' Around this court were the tents of the tribe of Levi, and then at a greater distance the encampments of the other tribes, three tribes on each side of the tabernacle. Within the Holy Place was the golden table of shewbread on the north side, and the golden candlestick on the south side, and the golden altar of incense, with their instruments. In the Most Holy Place was the ark of the covenant, with its cover, the mercy-seat, the symbol of Jehovah's throne.

The institution of the tabernacle was in perfect accordance with the spirit of the Israelitish constitution. God was the king of Israel; he had promised to be with them, and to go with them in their journeys; and the tabernacle was his abode. Here the glory which was the symbol of his presence was displayed, and hither the people came to worship him and to inquire his will, while his chosen servants (the priests) attended con-

stantly upon him. (Ps., lxxxiv. 4–7.) When Israel was firmly settled in the promised land, and a special place was fixed on for the display of God's presence, the moveable tabernacle was superseded by the permanent temple. The New Testament assigns to the tabernacle a higher meaning, as typical of the blessings of the Gospel. (Heb., ix.)

TABERNACLES, FEAST OF, was the last of the three great annual festivals of the Israelites, which required the presence of all the people in Jerusalem (Exod., xxiii. 16; Levit., xxiii. 34; Numb., xxix. 12; Deut., xvi. 13). Its object was to commemorate the dwelling of the people in tents during their journeys in the wilderness; and it was also a feast of thanksgiving for the harvest and vintage, whence it is called 'the feast of ingathering.' It was celebrated in the autumn, at the conclusion of the vintage, and lasted eight days, namely, from the 15th to the 23rd of the seventh month (Tisri, which corresponds to October).

Like many others of the institutions of the Mosaic law, the feast of tabernacles was neglected during the period from the settlement of Israel in Palestine to the Captivity. It was revived in the time of Ezra and Nehemiah. (Nehem., viii.)

TABERNÆMONTA'NA, a genus of the natural family *Apocyneæ*, found in the West Indies and South America, also in Australia, India, and other tropical parts of Asia. The cream-like sap of *T. utilis*, the Milk-Tree of Demerara, is not only of an innoxious character, but said to be very nourishing.

TABES. This word belongs to a period in the history of medicine, when nosologists were less informed than they now are of the true nature of many diseases; and, instead of classifying them according to their essential characters in reference to the single standard of healthy function, they selected and arranged such signs and appearances only as were sensibly manifest to the observer, or were described by the patient. The nomenclature founded on this arrangement consisted in naming by uninterrupted symptoms: it gave great opportunity of empirical practice. Thus a cough, a dropsy, a palpitation of the heart, would be spoken of as individual diseases; whereas they may on the one hand be joint symptoms of a single malady (as imperfect valvular action of the heart); or, on the other hand, taken singly each would be but a sign, common to many disorders, which might have no other feature of resemblance, and might require even opposite treatment. Such a name is 'tabes,' and under it are isolated certain symptoms, afforded by the nutritive functions in various conditions of unhealth: the acceptation of the word being a 'cachexia (or state of chronic ill-health) attended by emaciation;' in which sense it is synonymous with the words 'atrophy' and 'marasmus.'

Tabes mesenterica is that wasting of the body which follows scrofulous inflammation of the mesenteric glands; and *Tabes dorsalis* denotes an impairment of general health, attended by emaciation, muscular debility, and signs of nervous exhaustion, in persons who have given inordinate licence to the sexual appetite.

The treatment of the emaciation and debility which constitute the symptomatic state called tabes, must be adapted to remedy the primary disease. If exhaustive discharges exist, measures must be taken to arrest them, which will vary according as the drain from the system is maintained by diarrhœa, hæmorrhage, or suppuration. If absence of healthy food, or inability of the digestive organs to appropriate nourishment, has caused the emaciation, nutritious diet, with careful regard to the intestinal complaint, must be adopted. In all cases the main object of the practitioner is to effect a removal of the noxious influence which has deteriorated the health; and success in this particular, followed by such tonic treatment as may be called for, will re-establish the natural balance of healthy nutrition.

TABLE. By a table is meant a quantity of information arranged under heads in such manner that by looking under one head the general disposition of the whole points out where to look for the matters of information connected with that head. In any astronomical table, the matter by which we enter the table to look for other matter is called the *argument;* that which is found by means of the argument has no distinct name; we might call it the *tabular result.* It would be useful to generalise these terms. Thus in a table of contents, the number of the page or chapter is the argument, and the abstract of the matter contained is the tabular result: in an alphabetical index the principal word, found by means of its first letter, is the argument; and the number of the page in which the matter is contained is the tabular result.

When the matter sought for is found by one argument only, the table is said to be of *single entry;* when by two, of *double entry.* Thus the common multiplication table is one of double entry; and so is any chronological table which consists of more than one column.

The method of printing mathematical tables is usually defined so closely by the nature of the subject, that no remark is necessary except on the type. The numeral characters, up to about the year 1785, used to be smaller in the body than those now constructed, with distinguishing heads and tails. Dr. Hutton, we believe, first employed the character in which all the numerals are of the same depth, the heads or tails being compressed into the body. This very disadvantageous change was adopted by the type-founders, but only in England: the consequence was that the superior legibility of the ancient and of the modern continental tables was matter of common remark among those who had to use them. Another circumstance which contributed to this result was the introduction of numerals with thick and thin parts, the superior elegance of which was supposed to be a recommendation. The consequence was, that in many English tables it was difficult to distinguish 3 from 8, and 9 or 6 from 0. Of late years however some works have been published which have used the old type, both as to heads and tails and uniform thickness; and their decided superiority over tables of the Huttonian character, even of much larger type, is pretty generally admitted. This is a point of great importance: for

any circumstance which produces a wrong result upon the computer's paper is equally to be deprecated, whether it be an error in the formula used by the author of the tables, or an incorrectness of the printer or reviser; and in like manner a given amount of tendency to error is of the same bad consequence, whether it be due to the mathematician or the type-founder. This is not true of works of theory or reasoning: it may there be the fault of the reader if he do not correct a mere slip, whether of the author or printer; but in works of reference all the parties to the result are of equal importance.

The restoration of the old numerical type, namely, that in which all the figures except 0, 1, 2, have a head or a tail, and in which the thickness does not vary sensibly from one part to another, was adopted and recommended by the Astronomical Society at the end of 1842; but it had previously been used by Mr. Baily in his detail of the Cavendish experiment, which forms one volume of the Memoirs of that Society. The writer of this article, who first suggested the revival of the old figure (and caused it to be employed in Taylor and Walton's five-figure logarithms, in their reprint of Barlow's Tables, and in his own work on Arithmetic, before any one else had used it) is decidedly of opinion that one more change is yet wanting, the substitution of dull and rather dark paper for the bright and shining material now in general use, which dazzles the eye too much. Tables should not be hot-pressed, and not even pressed at all. The mischiefs of pressure are two-fold; first, the smooth surface thereby created makes the page a kind of mirror, which has a bright image in one place, whereas rough paper dissipates the light equally in all directions; secondly, the other side of the leaf shows through much more after pressure than before. It is also a mistake to suppose that great blackness in the ink, combined with great whiteness in the paper, is favourable to the reader. Every increase of the contrast, over and above what is necessary to perfect legibility, is injurious to it: jet upon snow would in time destroy the strongest eyes. Of all the things which are meant to be read, a black monumental inscription on white marble in a bright light is about the most difficult: one would suppose, to look at our specimens of expensive printing, that such an inscription was the model which it was intended to imitate, and if possible to surpass. We are satisfied, after many trials and comparisons, that a dull paper, of a whitish brown character, too thick to be seen through, and an ink which is of a dull-brown black, as it were the very deepest shade of the colour of the paper itself, are the things which are permanently agreeable to most eyes. Those who try it should remember that the first page read is not so good a test as the hundredth.

One of the most legible books we know of is the trade edition of Gibbon's 'Decline and Fall,' &c., in 12 vols. 8vo., London, 1820. It is considered by the booksellers themselves to be very badly executed. But printers and publishers are too much in the habit of forgetting that a book is a book and not a line engraving. They look at the page as a whole, and if the individual lines stand out and make their separate existences too perceptible, they pronounce it ugly. Accordingly, the uglier they hold it to be the more legible the reader will pronounce it.

We regret to see that, just as we are beginning to abandon the use of the thick even-sized figures, the Germans are taking strongly to them. Most of the modern German tables have these illegible characteristics.

We may divide mathematical tables into general and special; the first consisting of purely arithmetical and trigonometrical tables, and also tables of logarithms. The special tables are those which are used in the higher parts of mathematics, in commerce, navigation, astronomy, meteorology, &c. We may further divide tables into tables of facts and tables of mathematical results. All sciences have their tables of facts; thus the raw observations of astronomy, magnetism, and physics in general, are frequently tabulated: with these we have comparatively little to do, since they are rather the materials for the formation or verification of other tables, than of primary use as tables.

The practice of stereotyping tables is one which should be strongly enforced, if it were not that publishers seem now to be aware of its importance. A second edition derives no authority from the goodness of the first, because the printer, who is, as already observed, as important a person as the author in the matter of tables, has again stepped between the latter and the public. In reading the proofs of important tables, it is desirable that three persons should be employed, one to read from the manuscript, the others to watch two separate proofs, without communication with each other, as is done in the Nautical Almanac Office. The strictest investigation should take place in the proof which is taken from the stereotype, ordinary pains being taken with the previous proofs. Persons who have to correct the proofs of tables alone should bring the manuscript as near as possible to the proof by folding it conveniently: even if the folds were altered after every two or three lines, so as always to have both manuscript and proof under the eye in one position, it would not give more trouble than would be well repaid. Double figures should be particularly attended to; no mistake is so likely to be made, either by the compositor or the reader, as 744 for 774, and the like. This, and misplacing the order of the figures, as 012 for 102, are the things which it is most difficult to avoid. Again, of the two things under examination, manuscript and proof, the more difficult one should be looked at first, for the mind is apt to allow knowledge derived from the more easy to give help in interpreting the more difficult. Thus if the type be harder to read than the manuscript (a very common thing with our thick even-sized numerals), make out the proof first, and then look at the manuscript; and *vice versâ*. If two readings be given, vary the mode; the following may for instance be the plan adopted: if the manuscript column contain *a*, *b*, *c*, &c., and the printed column A, B, C, &c., look at *a*, compare it with A, then at B, compare it

with *b*, then at *c*, compare it with C, and so on; the order of inspection being *a*A, B*b*, c*C*, D*d*, &c. Some persons examine best by the eye alone, others by the ear also, repeating aloud. Each one must ascertain for himself which practice is best for him; but whatever it may be, it should be varied. Alteration of position, motion of the hand or foot occasionally to mark the transitions, change of the tone of repeating, &c., are useful: it is hardly credible, to those who have not tried, how much the perceptions are dulled by the monotonous comparison of one column of figures with another, or how many and how gross errors both eye and ear, when tired, will suffer to pass. Persons who are not much used to this labour might very well proceed as follows. Let them request the printer to make, at his own discretion, a certain number, say three, of mistakes (author-traps) in every page, carefully registering them, but not on the manuscript. The author may then be certain that he ought to detect three mistakes in every page, and will know that he has been careless if he have not that number at least. But at the same time, an author, who has not reason for confidence in himself, may very safely leave good manuscript tables entirely to the printer, if he make the latter understand that he does not intend to correct till all is printed off, and will require every page containing an error to be cancelled. No good printer would now refuse to engage to furnish a fac-simile of a manuscript, on the simple condition of being allowed to refer to the author for decision as to any doubtful word or figure in the writing; and the accuracy with which the first-rate London printers turn out their proofs is surprising.

An extensive list of tables is given in the 'Penny Cyclopædia,' and in the 'Supplement,' article 'Table.'

TABOR. [Bohemia.]

TABRIZ. [Persia.]

TACAZZE. [Nile.]

TACCA, a genus of plants of the natural family of *Taccaceæ*, placed near *Aroideæ* and *Aristochiæ*, and resembling *Dioscoreæ*. The plants of this family are possessed of some acridity both in their tubers and in their herbaceous parts, but the roots lose some of this quality by culture, at the same time that they become larger. Those of *T. pinnatifida*, the best-known species, and a native of the Malayan Peninsula, the Moluccas, Madagascar, and Australia, are roundish, red, the size of a man's fist, extremely bitter, and acrid. The tubers of this plant, and also those of *T. dubia* and of *T. montana*, are rasped and macerated for four or five days in water: a white highly nutritious fæcula, like arrow-root, is then separated, and, like sago, is employed as an article of diet by the inhabitants of the Malayan Peninsula and the Moluccas.

TACCA'CEÆ, a small natural order of Endogens belonging to the Epigynose group. There are but two genera belonging to this order, *Tacca* and *Ataccia*.

TACHY'DROMUS. This word is used by Daudin to designate a genus of lizards, placed by MM. Duméril and Bibron at the head of their first group of *Autosaures Cœlodontes*, viz. the *Cœlodonts*, with smooth toes, or *Leiodactyls*. Of this genus MM. Duméril and Bibron describe two species, *T. sexlineatus* and *T. Japonicus*. The first is a native of China, Cochin-China, and Java; the second of Japan.

TA'CITUS, CAIUS CORNE'LIUS, was probably born in the reign of Nero, but neither the place of his birth nor the exact date is known, nor is anything known of his parentage. The few facts of his life are chiefly collected from his own works, and from the letters of his friend the younger Pliny. Tacitus was about the same age as Pliny, but the elder of the two. Pliny was born about A.D. 61, in the reign of Nero, which commenced A.D. 54.

Tacitus states that he owed his first promotion to Vespasian, and that he was indebted for other favours to his successors Titus and Domitian ('Hist.,' i. 1). In A.D. 77, C. Julius Agricola, then consul, betrothed to him his daughter; and the marriage took place after the consulship of Agricola. In the reign of Domitian Tacitus assisted as one of the Quindecemviri at the celebration of the Ludi Seculares, which event took place in the fourteenth consulship of Domitian (A.D. 88). At that time he was also prætor ('Ann.,' xi. 11).

He was not at Rome when his father-in-law Agricola died there (A.D. 93), in the reign of Domitian. On the death of T. Verginius Rufus, in the reign of Nerva (A.D. 97), he was appointed Consul Suffectus.

Tacitus is recorded by his friend Pliny as one of the most eloquent orators of his age. The contemporaries of Tacitus were Quintilian, the two Plinys, Julius Florus, Maternus, M. Aper, and Vipsanius Messala. He was on terms of the greatest intimacy with the younger Pliny, in whose extant collection of letters there are eleven epistles from Pliny to Tacitus. In one of these letters (vi. 16) Pliny describes the circumstance of the death of his uncle, Pliny the Elder, and the letter was purposely written to supply Tacitus with facts for his historical works.

It is not known when Tacitus died, nor whether he left any children. The emperor Tacitus claimed the honour of being descended from him, but we have no means of judging of the accuracy of the pedigree.

The extant works of Tacitus are—the 'Life of Agricola,' the 'Treatise on the Germans,' 'Histories,' 'Annals,' and the 'Dialogue on Orators, or the Causes of the Decline of Eloquence.' None of his orations are preserved. The Histories comprehended the period from the accession of Galba to the death of Domitian. There are only extant the first four books and a part of the fifth, which comprehend little more than the events of one year. The fifth book contains the commencement of the story of the siege of Jerusalem by Titus. The Annals comprehended the history of Rome from the death of Augustus to the death of Nero, a period of fifty-two years. A part of the fifth book is lost; the seventh, eighth, ninth, tenth, the beginning of the eleventh, and the end of the sixteenth and last book, are also lost.

The tone which characterises the historical works of Tacitus is an elevation of thought which had its foundation in the moral dignity of the writer and the consciousness of having proposed to himself a noble object. He was a profound observer of character: it was his study to watch the slightest indications in human conduct, and by correctly interpreting these outward signs, to penetrate into the hidden recesses of the heart. His power of reaching those thoughts which are often almost unconsciously the springs of a man's actions, has perhaps never been equalled by any historical writer. Tacitus lived through a time when the value of philosophy had to be tested by its practical application, and his historical studies carried him through a period in which the mass were sunk in sensuality, and the really good and great had no consolation but in the consciousness of their own thoughts. Though he appears to belong to no sect of philosophers, his practical morality was of the Stoic school, the only school which in those degenerate times could sustain the sinking spirits of the Romans, and which even under favourable circumstances guided the conduct of the wise Aurelius. The religious opinions of Tacitus partook of the character of his age: he had no strong convictions, no settled belief of a moral government of the world: his love of virtue and his abhorrence of vice were purely moral; they had no reference to a future existence. ('Ann.' iii. 18; vi. 22.) In one of his earliest productions he hopes rather than expects that the souls of the departed may still live and be conscious of what is passing on earth. ('Agric.,' 46). But in his latest writings there are no traces that his hopes or his wishes had ripened into a belief.

The style of Tacitus, especially in his 'Annals,' is the apt expression of his thought: concise, vigorous, and dramatic. He has perhaps attained as great a degree of condensation as is compatible with perspicuity; sometimes his meaning is obscured by his labour to be brief. His historical works are especially works of art, constructed on a fixed principle, and elaborated in obedience to it. He loves to display his rhetorical skill, but he subdues it to his dramatic purpose. It is a fault that his art is too apparent, that his thoughts are sometimes imperfectly or obscurely expressed, that he affects an air of mystery, that his reflections on events are often an inseparable part of them, and consequently the impressions which it is his object to produce can only be rectified by the rigorous scrutiny of a matured mind.

The first edition of Tacitus, which is extremely rare, was printed at Venice, in 1470, by Vindelin de Spira: this edition contains only the last six books of the 'Annals,' the 'Histories,' the 'Germany,' and the 'Dialogue.' The editions of Tacitus are very numerous. One of the best is that of Ernesti, by Oberlin, Leipzig, 1801, 2 vols. 8vo.: it contains the valuable notes and excursus of Lipsius, the best of all the commentators on Tacitus, and in his department one of the first of modern scholars. There is an edition by Immanuel Bekker, Leipzig, 1831, 2 vols. 8vo., and a 'Lexicon Taciteum,' by Bötticher, Berlin, 1830, 8vo. There are translations of Tacitus in Danish, Swedish, Dutch, German, French, Italian, Spanish, Portuguese, and English. The Italian translation of Davanzati is considered to be a model of condensed and vigorous translation. D'Alembert translated into French various passages from Tacitus. The English version of Murphy, which appeared in 1793, is loose, diffuse, and feeble, and hardly expresses the meaning of the original. Gordon's version, which appeared before that of Murphy, is harsh and rugged, but generally faithful.

TACITUS, MARCUS CLAUDIUS, a Roman emperor, was the successor of Aurelian. After the interregnum of nearly seven months, which followed the death of that prince, the senate elected an emperor. At the advanced age of seventy-five, Tacitus, then princeps senatus, was chosen unanimously, in spite of his unwillingness to accept a dignity too great for his declining years. The army confirmed the act of the senate, and the new emperor commenced his reign in Sept., B.C. 275, with the most favourable assurances from all classes of his subjects. Tacitus immediately instituted some salutary reforms relating to the coinage and other matters; and he set an example of temperance, justice, and moderation. The frontiers of the empire were at this time in a disturbed state, and Tacitus committed the chief command of the East to Probus.

The Scythæ, or Goths, made an irruption at this time from the Palus Mæotis into Pontus and Cappadocia. Tacitus proceeded thither in person with his brother Florianus, and compelled them to retire by force of arms. But his reign, commenced with such fair prospects, was abruptly terminated. He had appointed Maximinus governor of Syria, who treated his subjects with such cruelty, that the magistrates of the towns in that province, aided by those yet surviving of the murderers of Aurelian, conspired against him and killed him. Despair of pardon led them to form designs against the life of the emperor, who fell a victim to their treason at Tyana in Cappadocia, after a reign of about eight months, in the spring of the year 276. After his death his brother Florianus seized the empire, but was put to death two or three months afterwards.

TACKING is an operation with the rudder and sails, by which, when a ship is proceeding in a course making any acute angle with the direction of the wind on one of her bows, her head may be turned towards the wind so that she may sail on a course making nearly the same angle with its direction on the other bow.

In order to accomplish this motion, the sails being already braced obliquely so as to allow the ship to have as much velocity as possible in her actual direction, the helm is turned a-lee, when the force of the water on the rudder, together with that of the wind on the mizen-sail, causes the ship gradually to turn her head towards the wind. When, by this motion, the main and fore sails are brought in such positions that the wind presses them against their masts, the mainsail is braced round to the opposite side of the ship, and the action of the wind on the foresail, while it arrests the forward motion of the ship, turns her head round from the direction of the wind so as

to bring the latter upon the other bow: the foresail is then braced rapidly round on the other tack, that is, parallel to the new position of the mainsail, when it is immediately filled by the wind, and the ship proceeds in the new course.

TACQUET, ANDREW, a mathematician of some celebrity, who was born at Antwerp in 1611. He entered at an early age into the order of the Jesuits, and was one of the many members of that body who distinguished himself by the works which they composed for the advancement of the sciences. He held the post of professor of mathematics during fifteen years, and died Dec. 23, 1660.

A collection of the principal works of Tacquet was published at Antwerp in 1669, in two folio volumes, under the title of 'Opera Mathematica demonstrata et propugnata à S. L.,' &c. Among these works are Astronomiæ libri octo; Geometriæ Practicæ libri tres; Opticæ libri tres; Catoptricæ libri tres; Architecturæ Militaris liber unus; Cylindricorum et Annularium libri quinque; and Dissertatio de Circulorum Volutionibus.

TACTICS (*τακτική*) properly signifies the art of forming the troops of an army in order of battle, and of making changes in the dispositions of either according as circumstances may require.

Previously to the commencement of active warfare, it is necessary to occupy one fortified place or more near the frontiers of an enemy's country, for the purpose of placing there in security the magazines of an army, and of receiving support in the event of being obliged to retire. The fortresses occupied by an army constitute the *base*, and the roads by which it is to advance to the immediate seat of war are called *lines of operation*.

A single line of operations is considered unfavourable, unless it be at all seasons secure against the enterprises of the enemy, and the like may be said of lines of route at considerable distances from each other, since the troops moving on them may not be able to support each other in the event of those on any one road being attacked. Diverging, or, as they are called, eccentric lines, proceeding from any one point or more in a base, may be considered as advantageous for offensive operations, since by them bodies of troops may be rapidly moved up at once to different points in an enemy's line; and if compelled to retreat from such points, they will gradually approach towards each other: they will thus be enabled to unite at some point in the rear, and afford each other mutual support. On the other hand, it must be observed that concentric, or converging lines of operation in rear of an army are sometimes unfavourable for a retreat.

The manner of reconnoitring ground, of selecting positions, and of performing the details of military manœuvres, have been described under RECONNOISSANCE, MILITARY POSITIONS, and EVOLUTIONS, MILITARY. In the present article, it is intended merely to explain the principles of tactics with relation to the marches of armies, the general movements on a field of battle, and the conduct of a retreat.

Marches comprehend all the movements by which an army transports itself from one place to another. During a campaign, and in the enemy's sight, marches are made in order to attack some important position which he may occupy, or succour some post which he may threaten, or in order to fall back on the magazines of the army.

When an army already encamped in order of battle is to advance towards the ground directly before it, the march is said to be to the front; and if it is to proceed to ground on the right or left of the line, the movement is called a flank march. In a march in front the army may be divided into several short columns, so as to be able with facility, if suddenly attacked, to deploy into line at any moment, either during the march or on arriving in the new position. In a flank march along nearly parallel roads, the lines of route should be as near together as possible, that the troops may readily move into their proper places in reforming the line; and it is obvious that, in such marches, the divisions in each column should be well closed together; for should they become separated by rivers, marshes, or any other obstacles, the enemy might seize the opportunity to attack a division before it could be supported by the others.

In the usual order of march the artillery should be formed in divisions corresponding to those of the troops, in order that each column may have a portion attached to it, and ready to act with it in the event of being obliged suddenly to come to action independently of the rest of the army. During the march, the place of the artillery is in rear of the column to which it belongs, that it may not impede the movement of the troops; that of the reserve artillery being behind the centre column.

At the commencement of a war, whether offensive or defensive, an army should be so posted that, by short movements, it may reach the enemy; and, in the former case, should the army penetrate into the enemy's country, some strong posts should be secured, in order that they may serve to protect the succeeding operations. Fortified places are usually on rivers, or in situations from whence cross-roads diverge into the country; and the possession of even one such place would be advantageous, as a depôt for artillery and stores, while the rivers or roads would facilitate the conveyance of supplies to the army.

When two armies are in the neighbourhood of each other, an engagement, either general or partial, may take place. A general action may become necessary when an invasion of a country is to be prevented, when a besieged fortress is to be relieved, when the position occupied is to be defended, or when that which is occupied by the enemy so far obstructs the communications as to deprive the army of the means of subsistence. A battle may also be hazarded if the position of the enemy be disadvantageous, if the divisions of his army are ill supported, or if his force is weakened, either from some part being badly covered, or from considerable detachments having been made.

The order of battle immediately previous to an engagement depends so much on the facility which the ground may afford for disposing and moving the troops, that it is scarcely possible to assign any rule for the formation; yet it is usual among

military writers to class all the different dispositions of an army under two kinds, which are designated the *parallel* and the *oblique* order. The first comprehends all dispositions in which the troops of both armies may be engaged at once along the whole of their fronts: it is now seldom adopted, since the weaker army is in danger of being outflanked, and, if defeated, of being entirely ruined. The principle of the oblique order consists in such a disposition of the troops as may enable a portion of the army to engage at some one point in the enemy's line, while the rest, protected by the obstacles of the ground, is stationed so as to be able to support the troops engaged, or prevent the enemy at other points of his line from attacking those troops in flank.

The attack is generally directed against one of the enemy's wings in the hope of being able to turn it, that is to get beyond its extremity, or in its rear, and thus to cut off its retreat or intercept its supplies; but if the wings are well protected, and if at the same time the centre has been weakened by troops having been drawn away, the attack may be advantageously made against that part of the line. At the battle of Eckmühl (1809), Napoleon with his right wing attacked and defeated the left of the Austrians: by this success he cut them off from Vienna, and compelled them to retire towards Bohemia.

Whatever be the order of battle, a strong reserve of troops is necessary in order that any part of the army may be succoured by it when weakened by losses, or when in danger of being overpowered by numbers. Strong reserves are particularly necessary when armies engage on a plain, as then the whole of a line may be forced into action, and in the event of being defeated, its ruin would be inevitable without the support of a numerous body of troops.

When cavalry commence an action, their charge should be preceded by a fire of horse-artillery placed on one of the wings. The artillery and cavalry immediately afterwards move rapidly forward. The former, having discharged some rounds of grape-shot, retire, and the cavalry are left to execute their charge.

Infantry generally commence an attack by a fire of light troops; and these are accompanied by a part of the artillery, which joins in the firing, the rest remaining in reserve. If the skirmishers retire in order to allow the first line of the army to engage the enemy, the reserve artillery is brought up with that line, and it disposes itself by the side of that which had previously been in action, or it goes to one of the wings. Should the enemy's line become disordered, the horse-artillery gallops up to within range of grape-shot, and completes the victory.

The stations of artillery in a defensive position should be such that this arm may have the most effect upon the enemy's artillery, or upon his troops, at a distance; and if the army is on the offensive, the artillery should be where it can best support the columns of attack. The guns should not however be placed in position till they are wanted, in order that they may be as little as possible exposed to the fire of the enemy; and if any battery is subject to a heavy cannonade, another should be immediately placed in a situation where its fire may cross that of the first battery on the ground occupied by the enemy's guns.

Artillery consisting of 9-pounder guns are found most convenient for the batteries which are placed with the troops: such guns are capable of serving to defend the position, and they may be employed to destroy walls, displace abatis, or ruin field intrenchments. Howitzers are also used in the field for the purpose of throwing shells into redoubts or villages, or among troops protected by hedges, hollow-ways, &c., where the shot from gun-batteries could not take effect. Horse-artillery should be kept with the reserve, and be ready to advance wherever it may be required.

Armies, whether on the offensive or defensive, are generally kept in columns till the proper moment for deploying has arrived; for by this disposition both parties are enabled to conceal their projects from each other till one of them has determined to commence the action. If a position is such that the army occupying it is exposed at several points to be attacked, those points should be occupied by small bodies of troops, the bulk of the army being kept behind in columns ready to march to any point where their services may be required.

If an army in position on level ground is to be attacked on one of its wings, supposed to be the weakest part of the line, the army acting against it is usually placed en échelon, each division consisting of a battalion or a brigade; and a favourable moment is then chosen for bringing the greatest mass in column against the wing. Should the enemy reinforce that part of his line by drawing troops from the opposite wing, the infantry of that column may change their route and proceed towards the now weakened extremity, concealing their strength as much as possible by passing through woods and hollow ways, if such there be, while the cavalry, supported by some infantry, move towards the first wing, as before, in order to deceive the enemy. Thus the disposition of the army is changed; and if the change is effected with rapidity, the enemy might not have time to reinforce the weakened wing before it would be turned.

When an army is attacked on one wing, and is in danger of being turned, it may endeavour to prevent the success of the manœuvre by throwing back that wing in a direction parallel to that of the attacking corps: this is called forming the army *en potence*. The angular point is however weak; for the troops, in being thrown back, may become crowded and disordered, and both parts of the line may become exposed to a raking fire from troops opposite the angle. It is evident however that the attacking troops cannot now turn the flank without making a circuitous movement, by which they may become separated from the rest of their line; and if the army is strong enough, it may form a line parallel to the direction of the wing thrown back. By such a movement the parallel order would be restored, and the other wing might even be made to turn the opposite wing of the enemy; this should of course be

attempted, as the return to a parallel order of battle leads to no useful result.

An attack on an enemy's line is often made by a strong division drawn up in one column for the purpose of forcing its way through the line at some point where it appears to be weak. This is the mode of attack which was practised with so much success by Napoleon against the continental armies, but which failed when attempted against the British troops, both in Spain and at Waterloo.

The attack in column possesses some advantages over one made by troops deployed in line while the men remain steady in the column; but there are several circumstances which more than counterbalance these advantages; and indeed an attack in column can scarcely succeed unless it be preceded by a heavy fire of artillery: this will put the enemy's line in disorder; and in the event of forcing it, the column may then be deployed in order to secure its advantages.

If a line, nearly equal in strength to that of the opponent, on being attacked in column were to stand firmly, it is probable that the attack would fail; and even if the line were penetrated, the troops by forming themselves in hollow squares, disposed chequer-wise, so that their fires may cross on the ground in their front, have invariably been found capable of resisting the efforts of the assailants.

The success of an action is often promoted by sending out a detachment with directions to fall on the flanks or rear of the enemy during the engagement: the sudden appearance of a body of troops in such a situation cannot fail to produce embarrassment in the army which is attacked, and to diminish the energy of its operations towards the front. On the other hand there is some danger in sending out large detachments from an army, as it is seldom possible to afford them due support; and therefore they may be cut off by the enemy. Detachments are however constantly sent out to protect the parties reconnoitring a country, to guard a convoy, or to support a foraging party: in these cases its object is less to fight than to cover a retreat. The troops therefore advance with circumspection, and retire when the enemy appears in superior force.

When the success of an action begins to be doubtful, and it is apprehended that the army must retreat, some of the heaviest artillery should be drawn off to a good position on the heights, or behind streams or hollow ways, while the lighter artillery remains engaged: the first line of the defeated troops is then made to pass through the intervals of the second, or of the reserve, while the latter continues the action. The first line should remain in order of battle in rear of the second, till the latter is enabled to retire; and this alternate retreat of the lines should be continued till the army can be thrown into columns of march, when the retreat may be protected by detachments of light troops.

When there are narrow defiles in rear of the field of battle, the retreat through them becomes extremely dangerous, for the army may be overtaken before it can get through; and if they are already occupied by the enemy's detachments, the retiring army may be annihilated or compelled to surrender. In order to pass a defile in safety, it ought to be previously occupied by troops: artillery and a reserve corps should also be stationed so as to defend the approaches on the advance of the enemy towards them.

The approach of winter, and the necessity of taking repose after the fatigues of a campaign, render it necessary for armies, whether on the defensive or otherwise, to take up positions where they may remain during the season of inaction. These positions, called winter-quarters, should be covered in front and on the flanks by rivers or other natural impediments to the approach of an enemy, or by forts constructed for defence. Several battalions of infantry and squadrons of cavalry are quartered in villages along the front of the position; the whole or a division of a company or of a squadron at each place: these posts may be strengthened by redoubts, palisades, or abatis.

When an army is in quarters, there are established alarm-posts, at which the troops should be appointed to assemble. These are frequently in the vicinity of a fortress, that the corps may be protected by the latter till all have assembled; but they should be in commanding situations, that, in the event of the enemy attempting a surprise, his movements may be easily seen.

(Bulow, *Esprit du Système de Guerre Moderne*, 1801; Guibert, *Œuvres Militaires*, 1803; Jomini, *Traité des Grandes Opérations Militaires*, 1811, with the continuation; Rogniat, *Considérations sur l'Art de la Guerre*, 1817.)

TADCASTER. [YORKSHIRE.]

TADMOR. [PALMYRA.]

TADPOLE. [FROGS.]

TÆNIOI'DES, a family of Acanthopterygious fishes nearly allied to the Mackerels. The species comprising it are all long flattened fishes, with very small scales. The following are among the principal genera.

Lepidopus, tænioid fishes with elongated snouts, a wide gape, projecting under jaw, and strong sharp cutting teeth. The ventral fins are reduced to small scaly plates. The tail is well formed. The *Lepidopus argyreus*, or Scabbard-Fish, is an example. It is of a bright silver colour, and attains a length of six feet. It is one of the rarest of British fishes.

Trichiurus resembles the last genus in the character of the head, but has neither ventral nor caudal fins, the tail being represented by a long slender compressed filament. The *Trichiurus lepturus* of Linnæus, an inhabitant of the Atlantic, attains a length of more than 12 feet, and resembles a beautiful silver riband.

Gymnetrus, the Deal-Fish, has a very small protractile mouth with small teeth. It has no anal fin, and the caudal is composed of few rays. The *Gymnetrus arcticus* is between four and six feet in length, but does not exceed a table-knife in thickness. An original description of it may be found in Dr. Fleming's 'British Animals.'

Cepola, the Ribbon-Fish or Band-Fish, is a well-known Mediterranean genus. The snout is short, the gape oblique, and the teeth well developed. The dorsal and anal fins are both long, and reach

to the base of the caudal. The ventrals are moderately developed. The *Cepola rubescens*, a beautiful fish about a foot long, and of a subpellucid carmine hue, is occasionally found on the southern coasts of Britain.

The genus *Lophotes* of Giorna has a short head with a bony crest bearing a long and stout spine. The caudal fin is distinct, but very small. The *Stylephorus* of Shaw is allied to *Gymnetrus*, but has the tail prolonged into a slender filament, exceeding the length of the body.

TÆNIOPTERI'NÆ, Mr. G. R. Gray's name for a group of insectivorous birds, constituting his second family of the MUSCICAPIDÆ.

TAFFI, A'NDREA, born at Florence, in 1213, deserves mention as having been the first who introduced among his countrymen the art of painting in mosaic, which he learnt from some Greek artists who were executing paintings in mosaic in the church of St. Mark at Venice. Taffi's chief performance was a Dead Christ, of large dimensions, in a chapel at Florence. He died in that city, in 1294.

TAFILET. [MAROCCO.]

TAGANROG, a town of European Russia, in the government of Ekaterinoslaf, stands on a high promontory near the north-eastern extremity of the Sea of Azof, in 47° 12′ N. lat., 48° 40′ E. long., and has 12,600 inhabitants, who are chiefly Greeks. The town is most advantageously situated for commerce. It is the chief place for all the intercourse between the provinces on the Donetz and the Don and foreign countries; goods are brought by land-carriage from the Volga also at no great expense. The exports from Taganrog are corn, iron and iron-ore, mast and building timber, hemp, pitch and tar, copper, potash, saltpetre, wool, leather, caviar, and fish. The navigation at Taganrog is shut by the frost from December till March; but the masses of ice swept into the strait of Jenikali or Kerch, frequently retard the ship communication between the Black Sea and the Sea of Azof for a full month later. The town is pretty well built; it is fortified, and has a gymnasium, ten churches, dockyards, large and numerous warehouses, and many very handsome private dwellings. The climate is temperate and remarkably healthy; the surrounding country is very fertile. Taganrog owes its existence to Peter the Great, who built a fortress here in 1706, which was demolished however according to the Convention of the Pruth in 1711. The fortifications were rebuilt, and the harbour enlarged, by Catherine II. about 1768. A colossal bronze statue of the Emperor Alexander, who died here Dec. 1, 1825, has been erected close to the Greek convent.

TAGUS, called by the Spaniards *Tajo*, by the Portuguese *Tejo*, the largest river of the Spanish Peninsula, rises at the junction of the Sierra de Albaracin with the Sierra Molina on the confines of Aragon and Castilla la Nueva, and, flowing in a general direction of W. by S., drains the great plain, partly in Spain, partly in Portugal, which is enclosed by the sierras of Castilla la Vieja, the Sierra de Gata, and the Serra de Estrella on the north, and by the Sierra Molina, the mountains of Toledo, the Sierra de Guadaloupe, and the highlands of Evora, on the south. Its length from its source to its mouth in the Atlantic Ocean, a little W. of Lisbon, is about 550 miles. The river on leaving its source runs in a north-west direction to its junction with the Molina, below which point it forms for a few miles the boundary between the two Castiles, and soon after sweeps round to the south-west, receiving the Guadiela on the left bank, and passing Aranjuez, opposite which it receives from the right the Jarama. A little below Aranjuez, the river runs nearly due W. past Toledo, Talavera, and Alcantara, in the province of Estremadura, receiving numerous torrents and rivers on either bank. Among its most important affluents in this part of its course are the Tietar and the Alagon, which last brings the drainage of the southern slopes of the Sierra de Gata into the Tagus. Below Alcantara, the Tagus for 30 miles forms the boundary between Spain and Portugal, leaving the territory of the former at the point where it is joined by the Ponsul on the right, and the Sever on the left bank. In Portugal the course of the river is nearly W.S.W. to its junction below Abrantes with the Zezere, which drains the eastern slope of the Serra de Estrella. From this point to its mouth the Tagus runs in a wide channel studded with numerous rocky and some alluvial islands in a south-west direction, passing Santarem, Salvaterra, and Lisbon, opposite which last city it forms one of the most spacious and most secure harbours in the world.

The poet's fancy has often decked out the Tagus and its banks in brilliant beauty; but, with the exception of the plains of Aranjuez and Talavera, the scenery is dreary and mean in the extreme. With the exceptions mentioned, the traveller sees a rapid muddy stream between steep banks in a narrow bed, considerably below the surface of the surrounding country, and nearly choked up in many places with rocks; the country along its banks, which are diversified here and there by a few dwarf oaks, is most commonly naked, arid, and uncultivated. In summer the stream, though always rapid, diminishes in depth so as to be fordable at several points, even as far down as Santarem; in winter it rises to a considerable height, and overflows the little level ground that is found along its banks. Some wretched beings still pick up a few particles of gold among its sands.

The navigation of the Tagus begins at Alcantara, but is interrupted by many rapids as far as Punhete opposite the junction of the Zezere; from Punhete to the sea large barges ply; and small ships ascend with the tide as far as Santarem. At its entrance into Portugal, the Tagus has a width of 64 yards; at Punhete it is 160 yards wide; below Salvaterra it resembles a gulf more than a river, being about 5 miles broad. Opposite the mole at Lisbon the width narrows to little over a mile, and continues nearly at this to the castle of San Julião. Opposite this fort a bar or bank divides the river into two channels, of which the northern is rather dangerous; the southern channel, nearly 900 yards wide and 47 feet deep, is safe, and has a good bottom.

TAIL, ESTATE. Originally if a gift of land were made to a man and the heirs male of his body, for instance, and if the donee had no heirs male of his body, or if after a male child was born no alienation was made, the land reverted to the donor on the failure of heirs male of the donee's body. The gift was a conditional fee, or a gift subject to a condition. [ESTATE.] The Statute of Westminster the Second, 13 Ed. I. c. 1, called the statute 'De Donis Conditionalibus,' enacted that the will of the donor should be observed, and that the land should go to the heirs specified if there were any, or if none, should revert to the donor. Before this statute the owner of a conditional fee acquired the power of alienation, if he had issue conformably to the terms of the gift; but this statute, though it did not directly take away the power of alienation, forbade the issue being disinherited by such alienation. It also gave the donor an estate in reversion, for the conditional fee was changed by this statute into a limited or particular estate. This particular estate was called an *Estate Tail*, from the French *talliare*, to cut, the particular estate being considered a portion of the fee. But the lawyers soon discovered a mode of enabling the owner of an estate tail to cut off the entail, as it was called, and to acquire the fee, by a fine or a recovery. The stat. 3 & 4 Wm. IV., c. 74, has substituted for the contrivance of fines and recoveries a much simpler way of effecting the same purpose.

'Tenant in fee tail,' says Littleton (s. 13), 'is by force of the statute of W. II., c. 1; and now by this statute, tenant in tail is in two manners, that is to say, either tenant in tail general, or tenant in tail special.' 'Tenant in tail general (s. 14, 15) is where lands or tenements are given to a man and to the heirs of his body begotten,' that is, to the heirs of his body by any woman whom he takes to wife. 'Tenant in tail special (s. 16) is where lands or tenements are given to a man and to his wife, and to the heirs of their two bodies begotten,' that is, no one can inherit by force of the gift but those engendered between these two persons.

TAIN. [ROSS AND CROMARTY.]

TAIN. [DROME.]

TAÏWAN (*Taywan*) is the Chinese name of an island which in Europe is known by the name of *Formosa*. It lies between 21° 58′ and 25° 15′ N. lat., and between 120° and 122° E. long., and extends from S. by W. to N. by E. about 240 miles. Its width varies from 60 to 100 miles. It is separated from the Chinese mainland by the channel of Fokien, 80 to 150 miles wide; and from the Bashee Islands by the channel of Formosa, 80 miles wide.

A bold range of mountains, supposed to reach a height of 12,000 feet, and covered with snow nearly throughout the year, extends north and south through the island. Their sides are clothed with fine trees and pasture-grounds. Many of the mountains are volcanic.

The mountains have a steep declivity on both sides, but on the west side they terminate at a considerable distance from the sea, so as to leave a wide tract between them and the shore. This tract has an undulating surface, and terminates on the sea in a low sandy beach. Rivers are numerous on this side; they are short, but rapid, and bring down much earthy matter from the mountains. The chief river, Tan-shuy-khy, is navigable to a considerable distance inland.

The sea, which surrounds the island on the west and east, is subject to very violent gales. In other respects the climate of the island is very temperate, neither the heat nor the cold being excessive on the plains along the western coast. The island is subject to earthquakes, and they are sometimes very violent. In 1782 the whole lower portion was laid waste, and the sea inundated the country to the base of the mountains for twelve hours. A great part of the capital was destroyed, and some hundreds of junks were lost.

The soil of the lower tracts and the more gentle slopes of the mountains is very fertile, and produces abundance of corn, rice of excellent quality, wheat, millet, maize, and several kinds of vegetables, among which are truffles. The sugar-cane is extensively cultivated, and the sugar made in the island goes to China as far as Peking. Tea, cotton, coffee, and silk, are cultivated to some extent. Fruit is abundant.

The domestic animals are cattle, buffaloes, horses, asses, and goats, but sheep and hogs are rare. The horses are small. Wild hogs, deer, monkeys, pheasants, and game, are very abundant. There are wild animals in the eastern districts. Salt is made to a great extent, and, together with sulphur, forms a large article of export.

The population consists of Chinese settlers and of aborigines. The Chinese are only found on the west side of the island, where they first settled in 1662. Their number many years ago was stated to be about 500,000 individuals. They are mostly from Fokien, and have preserved the customs of their original country, and the spirit of industry and enterprise by which their countrymen are distinguished. A considerable number of aborigines are settled among the Chinese, to whom they are subject, and are obliged to pay a tribute in corn and money; they belong to the Malay race.

The Chinese portion of Taïwan is divided into four districts. The capital, Taïwan-foo, is a considerable place, and has a wall built in 1725. The streets are straight, and intersect one another at right angles: they are full of shops, which are abundantly provided with all articles of Chinese industry. The commerce of this place with China is considerable.

The island of Taïwan was known to the Chinese and Japanese at an early period, but they did not settle on it nor subject it to their sway. When the Dutch appeared in these seas, following the track of the Portuguese, they found no Chinese settlement either on the Ponghu Islands or on Taïwan. They made settlements in 1634, and established a flourishing colony, which was however broken up by a Chinese prince, who, defeated by a rival dynasty in China, established a petty sovereignty in Taïwan. It was given up to the Chinese emperor in 1683.

TALAVERA. [CASTILLA-LA-NUEVA.]

TALBOTYPE. [PHOTOGRAPHY.]

TALC, a mineral which occurs crystallised and massive. The primary form of the crystal is a rhomboid, but it usually occurs in the secondary form of hexagonal laminæ, and sometimes in long prisms. It is variously coloured, translucent, and easily separated into thin laminæ. It is met with in serpentine rocks in small quantity, with carbonate of lime, actinolite, steatite, massive talc, &c.

The massive varieties of talc are less flexible than the crystallised: they are principally of an apple-green colour, and sometimes of a radiated structure. Indurated talc is massive, of a greenish-gray colour. Talc consists chiefly of silica and magnesia.

TALEGALLA, a genus of birds peculiar to Australia, and placed by Mr. Gould with *Leipoa* and *Megapodius*, under the family of *Megapodiidæ* (Mr. G. R. Gray's subfamily *Megapodiinæ* of his family *Palamedeidæ*). [PALAMEDEA.] Only one definite species is known, viz. *Talegalla Lathami*, or the *Wattled Talegalla*, the New Holland Vulture of Latham, a bird respecting the real affinities and habits of which nothing was definitely known prior to the researches of Mr. Gould, whose account of its habits and manners is detailed at length in his 'Birds of Australia.' Mr. Swainson regarded it as one of the *Vulturidæ*, but it is in truth a bird of the Rasorial order. [RASORES.]

Mr. Gould gives the following synonyms:—*New Holland Vulture*, Lath., genus *Alectura*; *Alectura Lathami*, J. E. Gray; *New Holland Vulture*, *Catheturus Australis*, Sw.; *Meleagris Lindesargii*, Jameson; *Brush Turkey* of the colonists.

Mr. Gould describes *Talegalla Lathami*, or the *Wattled Talegalla*, as a gregarious bird, generally moving about in small companies, much after the manner of the *Gallinaceæ*, and, like some species of that tribe, very shy and distrustful. When it is disturbed he states that it readily eludes pursuit by the facility with which it runs through the tangled brush. If hard pressed, or where rushed upon by their great enemy, the native dog, the whole company spring upon the lowermost bough of some neighbouring tree, and, by a succession of leaps from branch to branch, ascend to the top, and either perch there or fly off to another part of the brush. They resort also to the branches of trees as a shelter from the sun in the middle of the day, a habit which Mr. Gould notices as greatly tending to their destruction; for the sportsman is enabled to take a sure aim, and the birds, like the ruffed grouse of America, will allow a succession of shots to be fired till they are all brought down.

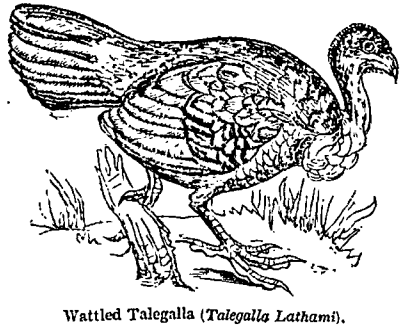
But the most remarkable circumstance connected with the economy of this bird is its nidification, for it does not hatch its eggs by incubation. It collects together a great heap of decaying vegetables as the place of deposit of its eggs, thus making a hot-bed, arising from the decomposition of the collected matter, by the heat of which the young are hatched. Mr. Gould describes this heap as the result of several weeks' collection by the birds previous to the period of laying, as varying in quantity from two to four-cart loads, and as of a perfectly pyramidical form. This mound, he states, is not the work of a single pair of birds, but is the result of the united labour of many: the same site appeared to Mr. Gould to be resorted to for several years in succession, from the great size and entire decomposition of the lower part, the birds adding a fresh supply of materials on each occasion previous to laying.

'The mode,' says Mr. Gould in continuation, 'in which the materials composing these mounds are accumulated is equally singular, the bird never using its bill, but always grasping a quantity in its foot, throwing it backwards to one common centre, and thus clearing the surface of the ground for a considerable distance so completely, that scarcely a leaf or a blade of grass is left. The heap being accumulated, and time allowed for a sufficient heat to be engendered, the eggs are deposited, not side by side, as is ordinarily the case, but planted at the distance of nine or twelve inches from each other, and buried at nearly an arm's depth, perfectly upright, with the large end upwards: they are covered up as they are laid, and allowed to remain until hatched. I have been credibly informed, both by natives and settlers living near their haunts, that it is not an unusual event to obtain nearly a bushel of eggs at one time from a single heap; and as they are delicious eating, they are eagerly sought after. Some of the natives state that the females are constantly in the neighbourhood of the heap about the time the young are likely to be hatched, and frequently uncover and cover them up again, apparently for the purpose of assisting those that may have appeared; while others have informed me that the eggs are merely deposited, and the young allowed to force their way unassisted. In all probability, as nature has adopted this mode of reproduction, she has also furnished the tender birds with the power of sustaining themselves from the earliest period; and the great size of the egg would equally lead to this conclusion, since in so large a space it is reasonable to suppose that the bird would be much more developed than is usually found in eggs of smaller dimensions. In further confirmation of this point, I may add, that in searching for eggs in one of the mounds, I discovered the remains of a young bird, apparently just excluded from the shell, and which was clothed with feathers, not with down, as is usually the case. The upright position of the eggs tends to strengthen the opinion that they are never disturbed after being deposited, as it is well known that the eggs of birds which are placed horizontally are frequently turned during incubation. Although, unfortunately, I was almost too late for the breeding-season, I nevertheless saw several of the heaps, both in the interior and at Illawarra: in every instance they were placed in the most retired and shady glens, and on the slope of a hill, the part above the nest being scratched clean, while all below remained untouched, as if the birds had found it more easy to convey the materials down than to throw them up. In one instance only was I fortunate enough to find a perfect egg, although the shells of many from which the young had been excluded were placed in the manner I have described. At Illawarra they were

rather deposited in the light vegetable mould than among the leaves, which formed a considerable heap above them. The eggs are perfectly white, of a long oval form, three inches and three quarters long by two inches and a half in diameter.' ('Birds of Australia.')

The same author relates that these birds, while stalking about the wood, frequently utter a loud clucking noise; and, in various parts of the bush, he observed depressions in the earth, which the natives informed him were made by the birds in dusting themselves. The stomach is stated by Mr. Gould to be extremely muscular; and he found the crop of one which he dissected filled with seeds, berries, and a few insects.

Description.—Adult male. Whole of the upper surface, wings, and tail, blackish-brown; the feathers of the under surface blackish-brown at the base, becoming silvery-gray at the tip; skin of the head and neck deep pink-red, thinly sprinkled with short hair-like blackish-brown feathers; wattle bright yellow, tinged with red where it unites with the red of the neck; bill black; irides and feet brown.



Wattled Talegalla (*Talegalla Lathami*).

Female about a fourth less than the male in size, but so closely the same in colour as to render a separate description unnecessary. She also possesses the wattle, but not to so great an extent.

Size about that of a turkey. Capable of domestication.

Locality, rather extensive. It inhabits all the bushes and scrubby forests of the eastern parts of Australia.

M. Lesson describes and figures in the 'Zoologie de la Coquille' a bird which he terms *Talegalla Cuvieri*. It is entirely black, of the size of a small common hen, and recalls to the mind of the observer some of the forms of the *Rallidæ*. It is a native of New Guinea.

We may here conveniently notice the genera *Leipoa* and *Megapodius*. [MEGAPODIIDÆ.]

Of the genus *Leipoa* Mr. Gould describes and figures one species, *Leipoa ocellata*, the Ocellated Leipoa.

In size this beautiful bird is inferior to *Talegalla Lathami*, and it is more slender and more elegantly formed. It is the *Native Pheasant* of the colonists of Western Australia.

Mr. Gould, in his 'Birds of Australia,' gives an account, collected by Mr. John Gilbert, from G. Moore, Esq., advocate-general, Mr. Armstrong, the aboriginal interpreter, and some of the more intelligent natives of Western Australia. The *Ocellated Leipoa* is there described as a ground-bird, never taking to a tree except when closely hunted: when hard pursued, it will frequently run its head into a bush, and is then easily taken. Food generally consisting of seeds and berries (also insects). The note mournful, very like that of a pigeon, but with a more inward tone. Eggs deposited in a mound of sand, the formation of which is the work of both sexes. According to the natives, the birds scratch up the sand for many yards round, forming a mound about three feet in height, the inside of which is constructed of alternate layers of dried leaves, grasses, &c., among which twelve eggs and upwards are deposited, and are covered up by the birds as they are laid; or, as the natives express it, 'the countenances of the eggs are never visible.' Upon these eggs the bird never sits, but when she has laid out her lay, as the henwives say, the whole are covered up, when the mound of sand resembles an ant's nest. The eggs, which are white, very slightly tinged with red, and about the size of a common fowl's egg, are hatched by the heat of the sun's rays, the vegetable lining retaining sufficient warmth during the night; they are deposited in layers, no two eggs being suffered to lie without a division.' Upon questioning one of the men attached to Mr. Moore's expedition, he gave to Mr. Gilbert a similar account of its habits and mode of incubating; adding, that in all the mounds they opened, they found ants almost as numerous as in an anthill; and that in many instances that part of the mound surrounding the lower portion of the eggs had become so hard, that they were obliged to chip round them with a chisel to get the eggs out; the insides of the mounds were always hot.

In his 'Introduction' (1848) Mr. Gould gives additional details from the pen of Capt. Sir G. Grey, of which we can only transcribe the following passage:—'There is only one male and female to each nest; they repair an old nest, and do not build a new one; both assist in scratching the sand to the nest. The female commences laying about the beginning of September, or when the spear-grass begins to shoot. Both sexes approach the nest together when the female is about to lay, and they take an equal share in covering and uncovering the mound. After every sunrise the female lays an egg, and lays altogether from 8 to 10. If the natives rob the nest she will only lay the full number of eggs twice in one summer. From the commencement of building until the eggs are hatched four moons elapse (this would give a very long period of time before the eggs were hatched). The young one scratches its way out alone; the mother does not assist it. They usually come out one at a time; occasionally a pair appear together. The mother, who is feeding in the scrub in the vicinity, hears its call, and runs to it. She then takes care of the young one as a European hen does of its chick. When the young are all hatched, the mother is accompanied by 8 or 10 young ones, who remain with

her until they are more than half grown. The male bird does not accompany them. The two sexes have different calls; that of the female is constantly uttered while she walks about in the scrub with her young ones.' The eggs are in great request. The old birds are timid, wary, and quick-sighted; they run very fast, and roost on trees. They are able to live for a long time without water; but drink when it rains.

For a more ample account, see 'Introduction to Birds of Australia,' wherein will be found a long letter on the subject from the late Mr. Gilbert, who fell a martyr to his zeal in zoological investigations, having been slain by the spear of a native.

Description.—Head and crest blackish-brown; neck and shoulders dark ash-gray; the fore part of the neck from the chin to the breast marked by a series of lanceolate feathers, which are black with a white stripe down the centre; back and wings conspicuously marked with three distinct bands of grayish white, brown and black near the tip of each feather, the marks assuming an ocellated form, particularly on the tips of the secondaries; primaries brown, their outer webs marked with two or three zigzag lines near their tip; all the under surface light buff, the tips of the flank feathers barred with black; tail blackish-brown, broadly tipped with buff; bill black; feet blackish-brown. (Gould.) Form stout and compact; size equal to that of a female turkey, but shorter on the legs.

Locality, Western Australia.

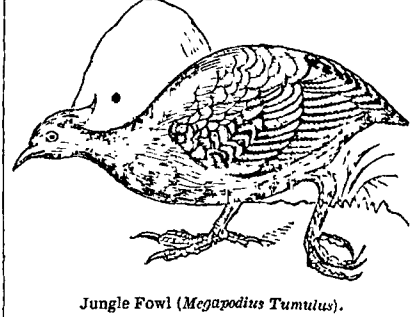
The genus *Megapodius* presents us with only one authenticated species from Australia, viz. *Megapodius Tumulus*, Gould. This is the *Jungle-Fowl* of the colonists of Port Essington. Other species are peculiar to the Indian and Philippine Islands, but nothing very certain is known about them.

The *Megapodius Tumulus* is a mound-maker like the preceding species, and according to Mr. Gould is rather numerously spread over the whole of the Cobourg Peninsula on the north coast of the Australian continent, where the British settlement of Port Essington is now established; he thinks that future research will require us to assign to it a much wider range, probably over the whole extent of the north coast.

After entering largely into many curious details respecting the mound-making habits of this bird, and its mode of depositing its eggs, and the large comparative size of the latter, Mr. Gilbert thus writes to Mr. Gould:—'The Jungle-Fowl is almost exclusively confined to the dense thickets immediately adjacent to the sea-beach: it appears never to go far inland, except along the banks of creeks. It is always met with in pairs or quite solitary, and feeds on the ground, its food consisting of roots, which its powerful claws enable it to scratch up with the utmost facility, and also of seeds, berries, and insects, particularly the larger species of Coleoptera. It is at all times a very difficult bird to procure; for although the rustling noise produced by its stiff pinions when flying away be frequently heard, the bird itself is seldom to be seen. Its flight is heavy and unsustained in the extreme; when first disturbed it invariably flies to a tree, and on alighting stretches out its head and neck in a straight line with its body, remaining in this position as stationary and motionless as the branch upon which it is perched: if however it becomes fairly alarmed, it takes a horizontal but laborious flight for about a hundred yards with its legs hanging down as if broken. I did not myself detect any note or cry, but from the natives' description and imitation of it, it much resembles the clucking of the domestic fowl, ending with a scream like that of the peacock. I observed that the birds continued to lay from the latter part of August to March, when I left that part of the country; and, according to the testimony of the natives, there is only an interval of about four or five months, the driest and hottest part of the year, between their seasons of incubation. The composition of the mound appears to influence the colouring of a thin epidermis with which the eggs are covered, and which readily chips off, showing the true shell to be white; those deposited in the black soil are always of a dark reddish-brown; while those from the sandy hillocks near the beach are of a dirty yellowish-white: they differ a good deal in size, but in form they all assimilate, both ends being equal: they are three inches and five lines long by two inches and three lines broad.' ('Birds of Australia.')

Description.—Head and crest very deep cinnamon-brown; back of the neck and all the under surface very dark gray; back and wings cinnamon-brown; upper and under tail-coverts dark chestnut-brown; tail blackish-brown; irides generally dark brown, but in some specimens light reddish-brown; bill reddish-brown, with yellow edges; tarsi and feet bright orange, the scales on the front of the tarsi from the fourth downwards, and the scales of the toes, dark reddish-brown. (Gould.)

Size about that of a common fowl.



Jungle Fowl (*Megapodius Tumulus*).

The mounds often exceed 8, 12, or 14 feet in height, and are 77 or even 150 feet in circumference. The eggs are embedded at a depth of 6 feet or more from the nearest part of the surface. The mound consists of earth, stones, decaying branches, leaves, roots, and other vegetable matters, fitted, during decomposition, to form a hot-bed.

TALENT (τάλαντον) was the highest denomination of Greek weights and money, and was also commonly used by Greek writers as the translation of words signifying a certain weight in other

languages. It is necessary to observe that the talent is properly only a denomination of weight. There was no coin of that name.

The Hebrew Talent, or Kikkar, contained 3000 shekels, and its weight was 93lbs. 12oz. avoirdupois, and its value as silver money 396*l.* 5*s.* 10*d.*

The following were the principal denominations of weight and money among the Greeks:—ὀβολός, δραχμή, μνᾶ, τάλαντον, of which the ὀβολός was the smallest. Their relative proportions are shown in the annexed table:—

Obol			
6	Drachma		
600	100	Mina	
36,000	6000	60	Talent.

This system prevailed throughout Greece, but the actual values of the talent varied in different states. Most of these variations may be included under two chief standards, namely, the Attic and the Æginetan.

The value of the Attic Talent before the time of Solon is a matter on which we possess hardly any historical information, though we may perhaps arrive at a very probable result. Looking then at the system after Solon had remodelled the coinage, we find that the Attic silver money was celebrated for its purity; and therefore from the coins of that period which still exist, we may determine the value of the standard with tolerable certainty. Now the chief coin was the drachma of silver, the average weight of which, from the time of Solon to that of Alexander the Great, is found to be 66.5 grains. From this we get the following values in avoirdupois weight:—

	lb.	oz.	gr.
Obol	„	„	11.08
Drachma	„	„	66.5
Mina	„	15	83.75
Talent	56	15¼	100.32

This was the standard always used for silver money, and was therefore called 'the silver standard.'

Besides this there was another standard, the chief weight of which was called *the commercial mina*, and contained 138 drachmæ, that is, not that a commercial mina contained 138 *commercial* drachmæ, but that this was quite a different standard from that used for silver money, its unit being to that of the latter in the ratio of 138:100; while the *relative* proportions of the weights were the same in both systems. The following table shows the value of the Attic commercial standard:

	lb.	oz.	gr.
Obol	„	„	15.29
Drachma	„	„	91.77
Mina	1	4¾	93.69
Talent	75	5¾	14.69

These weights were used for all commodities, except such as were expressly required by law to be sold by the silver standard.

This commercial standard is most probably the real ancient Attic standard, as it existed before the time of Solon. The purpose of Solon's change was to lower the value of money, in order to relieve debtors. The Euboïc Talent was often reckoned as equal to the Attic; but it is also described with greater precision by Ælian as having to the Attic the ratio of 72:70.

It is a disputed question what was the ratio of the Æginetan to the Attic talent. Pollux says that the Æginetan talent contained 10,000 Attic drachmæ, and the Æginetan drachma 10 Attic obols, which would give the ratio of 5:3 for that of the Æginetan to the Attic talent. According to this statement, the Æginetan drachma weighed 110 grains English: but the existing coins give an average of only 96 grains. Böckh adheres to the statement of Pollux, and on the whole he appears to be right. There were other talents used by the Greeks and Romans. The most important variations of the Æginetan standard were those used in Macedonia, Corinth, and Sicily.

The above talents were all reckoned in silver money. There was also a talent of gold, which was much smaller. It was used chiefly by the Greeks of Italy and Sicily, whence it was called the Sicilian Talent as well as the Gold Talent. It was equal to 6 Attic drachmæ, that is about ¾ oz. and 71 grs. When Homer uses the word Talent we must always understand by it this small one of gold. In other classical writers the word generally means the Attic Talent.

TA'LES. When the number of jurymen in attendance was so small, or so much diminished by challenges that a full jury could not be had, a writ (then in Latin) issued to the sheriff, commanding him to summon *such* (tales) other fit persons, &c., for the purpose of making up the jury. The jurors so procured were called talesmen, from the Latin word used in the writ. By the statute 35 Hen. VIII., c. 6, the defect of jurors might, at the request of the plaintiff or defendant in an action, be supplied from such other able persons of the said county then present, and these were ordinarily called, from the words in the Latin writ, 'tales de circumstantibus.' Subsequent statutes extended and regulated the application of this statute. But the act now in force is 6 Geo. IV., c. 50, of which the 37th section contains the existing law on the subject.

TALIACO'TIUS, GASPAR, in Italian *Taliacozio*, was professor of anatomy and surgery at Bologna, where he died in 1553, at the age of 64 years. His name is now known chiefly through his reputation for restoring lost noses; but during his life he was equally celebrated for his knowledge of anatomy and his excellence as a lecturer.

The work in which Taliacotius describes his method of restoring noses was first published forty-four years after his death, with the title 'De Curtorum Chirurgia per Insitionem libri duo,' Venetiis, 1597, folio. It is divided into two parts, of which the first is chiefly devoted to a disquisition upon the nose, lips, and ears, and the theory of the operation, which he considers to be exactly analogous to that of grafting upon trees. In the second book he describes the operation itself, which was a very elaborate process occupying several weeks. His method of forming the nose was by engrafting a portion of the skin of the patient's arm, which was held close to the face by a

very ingenious contrivance, until the junction was complete. The operation of forming a nose has been performed in recent times by Mr. Carpue and others, in a simpler and more perfect manner, by gradually drawing down the skin of the forehead upon a mould of wax or similar material.

TALISH. [GEORGIA.]

TA'LISMAN an Arabic word, supposed to be derived from the Greek *telesma*, is a figure cast in metal or cut in stone, and made with certain superstitious ceremonies, when two planets are in conjunction, or when a certain star is at its culminating point. A talisman thus prepared is supposed to exercise an influence over the bearer, preserving him from disease, rendering him invulnerable in battle, and so forth. The superstition has been very general. The Egyptians, the Arabs, and the Turks, used talismans, and they are not yet entirely gone out of use among those nations. Christians even were not exempt from similar superstitions. In the middle ages relics of saints, consecrated candles, rods, rosaries, &c., were employed, and still are, in Spain and in some parts of Italy. The African negroes have their *fetish*, and the American Indians their *medicine*.

TALLAGE is derived, according to Coke, from the law Latin word *tallagium* or *tailagium*, which, as he says, 'cometh of the French word *tailer*, to share or cut out a part, and metaphorically is taken when the king or any other hath a share or part of the value of a man's goods or chattels, or a share or part of the annual revenue of his lands, or puts any charge or burthen upon another;' so as *tallagium* is a general word, and doth include all subsidies, taxes, tenths, fifteenths, or other burthens or charge put or set upon any man.' It was generally however confined in its sense to taxes received by the king. The most important statute on the subject is entitled 'De Tallagio non concedendo,' which was passed in the 34th year of Edward III. to quiet the discontent which had arisen among the commons in consequence of the king having taken a tallage of all cities, boroughs, and towns without the assent of parliament. He was embroiled also with the nobles and landowners, from having attempted, unsuccessfully however, to compel all freeholders of land above the value of twenty pounds to contribute either men or money towards his wars in Flanders.

TALLAHASSEE. [FLORIDA.]

TALLEYRAND-PÉRIGORD, CHARLES MAURICE DE, was born at Paris, Feb. 13, 1754. His family was ancient and distinguished. The effects of a fall when about a year old rendered him lame for life, and he was early destined for the church. He was sent to the Collège d'Harcourt, and thence successively to the seminary of St. Sulpice and to the Sorbonne. When he had attained his 20th year, his parents introduced him at the festivities with which the coronation of Louis XVI. was celebrated (1774), under the title of the Abbé de Périgord, and he availed himself to the full extent of the indulgence with which his age and country regarded the irregularities of the young and noble among the priestly order.

In 1780, while yet only in his 26th year, he was appointed general agent of the clergy of France. He discharged the functions of this important office for eight years. In 1788 he was appointed bishop of Autun. As bishop of Autun he was a member of the Etats Généraux convoked in May, 1789, which continued to sit as an Assemblée Constituante till it dissolved itself Sept. 30, 1791. M. de Talleyrand had previously advocated the equality of all citizens in the eye of the law, and free discussion. When the three orders, by assenting to meet as one body, had enabled the Assembly to proceed to business, the precise directions by many of the bailliages to their deputies were found an impediment in the way of practical legislation. M. de Talleyrand moved that they should be entirely disregarded, and carried his motion. A constituent committee was appointed immediately after the capture of the Bastille, and he was the second person nominated a member of it. In the financial discussions which took place in the Committee and Assembly, M. de Talleyrand supported all or most of the various loans proposed by Necker, and seconded Mirabeau's exhortations to keep faith with the national creditor. He suggested practical measures with a view to this end, and among others the sale of church lands (he had previously supported the abolition of tithes), reserving however a competent provision for the priesthood, and even improving the condition of the poorer clergy. He also proposed to establish a 'caisse d'amortissement,' as an additional guarantee to the state's creditors. At the same time that he was taking part with his colleagues of the Constituent Committee in these and other labours, he was charged by them with the important task of preparing the report upon national education, which was read to the Assembly on the 10th, 11th, and 19th of September, 1791. The basis of the system advocated in this report was the secularisation of instruction. He also proposed or advocated measures for the support of an established church, and for adapting it to the new constitution, but in a short time he resigned his bishopric and renounced his ecclesiastical character.

After the Constituent Assembly was dissolved in 1791, M. Talleyrand, as a former member of it, was incapable of any legislative or ministerial office. The court party hated M. de Talleyrand for having taken part frankly with the Revolution, and the republicans hated him for his advocacy of a limited monarchy; but all parties agreed that he was the only man whose talents fitted him for the delicate mission to England. He was dispatched in January, 1792, without any ostensible diplomatic character, to attempt to commence negociations, but he was unsuccessful. After the accession of the Gironde party to office, the attempt to ensure at least neutrality on the part of England was renewed. Chauvelin was sent to England as nominal, and along with him Talleyrand as real, ambassador. By this time however public opinion was strongly opposed to the proceedings of the French government, but Talleyrand's good faith at this period in labouring to preserve peace, and the steadiness with which he pursued his object, undaunted by

the most gross personal insults, are satisfactorily established by the narrative of Dumont.

Talleyrand was at Paris when the events of Aug. 10 put an end to the monarchy; and it required all his dexterity to enable him to obtain passports from Danton, to enable him to quit Paris. He fled to England, and was obliged to sell his library to procure himself the means of support. The English government, after some time, ordered him to leave the country, and he was obliged to seek refuge in America.

Madame de Staël has claimed, and apparently with a good title, the credit of instigating Chenier to demand the recall of M. de Talleyrand after the termination of the reign of terror. The National Institute was founded about this time, and M. de Talleyrand had in his absence been appointed a member. At the first sitting of this society which he attended he was elected secretary, an office which he held for six months.

In 1797 M. de Talleyrand was appointed foreign minister under the Directory. His position under the Directory was an equivocal one. He was engaged, so long as he occupied it, in intrigues which had for their aim the maintenance of himself in office, even if his employers should be turned out; and he was obliged to do their unprincipled work. Having adopted a profession in which success could only be expected under a settled government, and believing a monarchical government to be the only one which could give tranquillity to his country, he naturally attached himself to the growing power of Bonaparte. For a time their alliance continued harmonious, and that was the time of Napoleon's success. The arrangement of the Concordat with the pope was the basis of the future empire, and that negociation was accomplished by Talleyrand. The treaty of Luneville, secularising the ecclesiastical principalities of Germany; the treaty of Amiens, recognising on the part of England the conquests of France, and the new form given to the continental states by the Revolution; the convention of Lyon, which gave form to the Cisalpine republic; all bear the impress of the peculiar views of M. de Talleyrand. After the battle of Ulm, Talleyrand addressed to the Emperor a plan for diminishing the power of Austria to interfere with the preponderance of France, by uniting Tyrol to the Helvetian republic, and erecting the Venetian territory into an independent republic interposed between the kingdom of Italy and the Austrian territories. Napoleon paid no attention to the proposal, although it was repeatedly pressed upon him. And we cannot but see in the difference of opinion the commencement of that coolness which induced Talleyrand, on Aug. 9, 1807, to resign the portfolio of foreign affairs and accept the nominal dignity of vice-grand-elector of the empire, in addition to the titles of grand-chamberlain and Prince of Benevento, which had previously been conferred upon him. In his capacity of chamberlain, he did the honours of the imperial court at Erfurt; and was on more than one occasion privately consulted by the Emperor. In 1809 however the ex-minister was so loud and unreserved in his condemnation of the Spanish expedition, that Napoleon, on his return from the Peninsula, deprived him of the office of chamberlain. In 1813 overtures were made to him with a view to his resuming the portfolio of foreign affairs, but without success. He is said to have predicted the downfall of the empire a year before.

In 1814, as vice-grand-elector of the empire, he was a member of the regency, but was prevented joining it at Blois by the national guard refusing to allow him to quit Paris, not much against his will. When Paris capitulated, the Emperor Alexander took up his residence in the house of the Prince of Benevento. M. de Talleyrand now exerted the influence he possessed over Alexander to obtain the combination of constitutional forms with the recognition of legitimacy. Louis XVIII. saved appearances by insisting upon being allowed to grant the charter spontaneously, but it was M. de Talleyrand's use of the remains of the revolutionary party that made him feel the necessity of this concession. He was sent to the congress of Vienna, in September, 1814, where he obtained much more favourable terms for France than she would otherwise have had. The descent of Napoleon however at Frejus again unsettled everything. M. de Talleyrand dictated the proclamation of Cambray, and he suggested the more liberal interpretation of the charter, announced from the same place. He obtained an extension of the democratic principle in the constitution of the Chamber of Deputies, recommended the rendering the peerage hereditary, and induced the king, restored for a second time, to institute a cabinet council, of which he was nominated the first president.

The constitutional monarchy, the object of his earlier wishes, was now definitively established; but the part he was destined to perform in it was that of a leader of opposition. In his note of Sept. 21, 1815, he protested, as prime minister, against the new terms which the allies intended to impose upon France. His argument was fruitless. Louis XVIII. bowed to the dictation of his powerful allies; and M. de Talleyrand resigned office two months before the conclusion of the treaty which narrowed the frontiers of France and amerced her in a heavy contribution.

After the revolution of 1830 M. de Talleyrand was appointed ambassador to the court of Great Britain, Sept. 5, 1830; and he held the appointment till Jan. 7, 1835, when he was succeeded by General Sebastiani. During these four years M. de Talleyrand, besides obtaining the recognition of the new order of things in France by the European powers, procured a similar recognition of the independence of Belgium, and concluded the quadruple alliance of England, France, Spain, and Portugal, for the purpose of re-establishing the peace of the Peninsula.

After his return from the mission to England, M. de Talleyrand retired from public life. The only occasion on which he again emerged was when he appeared at the Académie des Sciences Morales et Politiques, to pronounce the éloge of Count Reinhard, only three months before his own death. He died May 20, 1838.

TALLIS, THOMAS, the patriarch of English cathedral music, was born about 1529. He was a gentleman of the chapel to Edward VI. and to Mary; and under Elizabeth the place of organist was added to his other office. His entire Service, including prayers, responses, Litany, and nearly all of a musical kind comprised in our liturgy, and in use in our cathedrals, appears in Dr. Boyce's Collection, together with an anthem which has long been in high repute with the admirers of severe counterpoint.

In 1575 Tallis published in conjunction with his pupil, Bird (or Byrde), 'Cantiones Sacræ,' master-pieces of their kind. One of these, 'O Sacrum Convivium,' was adapted by Dean Aldrich to the words 'I call and cry,' and still continues to be frequently performed in our cathedrals. Two more of his anthems are printed in Dr. Arnold's Collection.

Tallis died in 1585, and was buried in the parish church of Greenwich.

TALLOW is animal fat melted and separated from the membranous matter which is naturally mixed with it. When pure, tallow is white, and nearly tasteless; but the tallow of commerce usually has a yellow tinge.

A very large proportion of the tallow used for making candles in this country is of home production, and is fitted for use by the *renderer*, who chops into pieces the fat and suet received from the butchers, and boils it in water, by which operation the greater part of the fat is melted out from the membranes, and floats to the top, whence it is removed by skimming. The remaining fat is subsequently squeezed from the membranes by a powerful press, leaving the membranous matter in the form of a cake or block, of a dark colour, which is called *graves*, and which, when macerated in warm water, softens and swells, and becomes a wholesome and palatable article of food for poultry, dogs, and other domestic animals. It is extensively used in fattening poultry for the market.

Almost all our imported tallow is brought from Russia, where this article is produced in enormous quantities. 250,000,000 lbs. are annually exported from Russia to various countries, mostly furnished from the steppes of Southern Russia. The cattle are bought by thousands, driven to the Salgans, or tallow factories, and there fattened and slaughtered. After the animals are slaughtered and skinned, a little of the flesh and the intestines are removed, and the rest of the carcass, cut into pieces, is thrown into the boilers, of which there are from four to six in every salgan, each large enough to contain the flesh of ten or fifteen oxen. During the boiling, the fat, as it collects at the top, is skimmed off with large ladles; and before it is quite cold it is poured into the casks in which it is afterwards shipped. The first fat which comes off is the best, and is quite white, while that which follows has a yellowish tinge; and a still coarser tallow is obtained by squeezing the bones and flesh in presses.

An ox in good condition will yield from seven to eight poods (250 to 290 lbs.) of tallow, which is generally worth from eleven to fifteen rubles a pood—about 1½*d.* to 2*d.* per lb. The merchants of St. Petersburg divide the tallow which they receive from the interior into white and yellow candle-tallow, and common and Siberian soap-tallow; the latter, which is considered the best tallow for soap-making being brought by water-transit from Siberia. Yellow candle-tallow, when good, should be clean, dry, hard when broken, and of a fine yellow colour throughout. The white candle-tallow, when good, is white, brittle, hard, dry, and clean. The best white tallow is brought from Woronesch.

The chief uses of tallow are noticed under CANDLE and SOAP. Palm-oil has recently come extensively into use as a substitute for tallow in candle-making. The tallow imported into Great Britain in 1848 amounted to 1,500,642 cwts., of which 1,411,944 cwts. (nearly 160,000,000 lbs.) were entered for home consumption. Foreign tallow pays an import duty of 1*s.* 6*d.* per cwt.

TALMA, FRANÇOIS JOSEPH, was born in Paris, Jan. 15, 1763. He spent a few of his early years in London, where his father practised as a dentist, but at nine years of age he was placed in a school at Chaillot. In 1781 he commenced the study of logic in the Collège Mazarin. In 1783 he made a trial of his skill as an actor at the Théâtre de Doyen, in the character of Seide, in the tragedy of 'Mahomet.' A council of friends pronounced it a failure. Talma deferred to this unfavourable opinion, and for a time assisted his father in his profession. On Nov. 21, 1787, however he made his début at the Théâtre Français, and in 1789 created a great sensation by his performance of Charles IX. At the commencement of the French Revolution he nearly fell a prey to a severe nervous disorder. On his recovery, and the retirement of Larive, Talma became the principal tragic actor. He reformed the costume of the stage, and first played the part of Titus in a Roman toga. He enjoyed the friendship both of Napoleon and Louis XVIII. On June 11, 1826, he appeared for the last time on the stage in the part of Charles VI. He died Oct. 19, 1826, and was buried in the cemetery of Père la Chaise. Talma was the greatest tragic actor that has appeared on the French stage. In person he was of the middle size, square-built, and with a dignified and expressive countenance. His voice was fine-toned and powerful; his attitudes were graceful, and his acting distinguished by its truth and energy.

TALPA. [TALPIDÆ.]

TA'LPIDÆ, the family of *Moles*, one of the insectivorous group of Cuvier's order of *Carnassiers*, embracing several genera, of which *Talpa* may be regarded as the type. In the genus *Talpa* the cranium is elongated and pointed, and there is a peculiar bone for the support and working of the muzzle. The part which extends from the internal side of the jaws terminates in three points, the one in the middle larger and more distant from the external edge than the other two. The very short arm attached by means of a long bladebone, and sustained by a vigorous clavicle, carries an extremely wide hand, the palm of which is always turned outwards or backwards. The sternum, like that of the birds and bats, has

an elevation or crest affording room for the large pectoral muscles. The pelvis and hinder extremities are comparatively feeble. The bones of the pubis are not joined.

This bony framework is set in motion by very powerful muscles. Those of the anterior extremities, the chest, and the neck are most vigorous, and in the cervical ligament a peculiar bone is even formed. The wide hand, which is the great instrument of action, and performs the offices of a pickaxe and shovel, is sharp-edged on its lower margin, and, when clothed with the integuments, the fingers are hardly distinguishable, but the terminating claws project long, strong, flat, and trenchant.

In these animals the senses of hearing, taste, and smell, are highly developed, but the organ of sight is almost rudimentary, and besides is so hidden amidst the close thickset velvet fur, that its very existence was for a long time denied. This minute eye however suffices for all natural requirements.

The generic characters of *Talpa* may be thus summed up:—Body stout and thick, furry; head elongated, pointed; muzzle cartilaginous, strengthened by the snout-bone; eyes very small; no external ears; anterior feet short and wide, with five united toes, armed with trenchant nails proper for digging; posterior feet with five toes also, but weak; tail short.

Incisors, $\frac{6}{8}$; canines, $\frac{1-1}{0}$; molars, $\frac{7-7}{7-7}=44$.

Example.—*Talpa Europæa*, the Common Mole.

This well-known animal, so familiar to all, is *La Taupe* of the French, *Talpa* of the Italians, *Topo* of the Spanish, *Maulwerf* of the Germans, *Muldvarp* of the Danes, *Mole* and *Moldwarp* of the British.

All are familiar with the form, habits, and general economy of the Common Mole—an animal which Pennant has well described, and also other later zoologists, among whom we may particularise Mr. Bell in his 'British Quadrupeds.' This zoologist embodies in his narrative a detail of the experiments of Henri Le Court, which were first laid before the public by De Vaux, 1803, and afterwards by Geoffroy St. Hilaire, in his 'Cours d'Histoire Naturelle des Mammifères,' after having visited Le Court for the purpose of testing his observations and witnessing his ingenious experiments. The interesting communications of M. Flourens, of Mr. Jackson, of Mr. Yarrell, M. Geoffroy himself, and others, are also presented by Mr. Bell to the reader. The mole is industrious, fierce, daring, and voracious, hunting by night on land, making young birds and reptiles its prey. It fastens on its victim like a bulldog, and buries its muzzle in the body of its prey. Underground it pursues worms and the larvæ of insects, working in winter to a very great depth. It is very impatient of hunger, but when that is appeased it lies in quiet repose within the sanctuary of its own fortress. Mid-day is its usual time for sleep. It swims with great address. The female forms her bed of grasses, roots, and other vegetable matters, and produces from 4 to 6 young at a birth, in the month of April or May, and sometimes later. Her breeding nest is remote from the fortress. This animal is unknown in the northern extremity of Scotland. It abounds throughout the greater portion of Western Europe.

The Prince of Musignano has well figured, in his excellent work 'Iconografia della Fauna Italica,' the species under consideration, and also the *Talpa cæca*, which may be the *Aspalax* of Aristotle. In this last species the middle incisive teeth are longer than the rest; in the common mole they are all equal, and De Vaux states that there is some difference, though not great, in the habits and architecture of the two species. Mr. Bell suggests that as both species are inhabitants of Europe, the original trivial name *Europæa* should be dropped, and Brisson's name *vulgaris*, be adopted for the common species.

TALUS, probably from 'taglio,' Ital., a cut, is a term used chiefly by writers on fortification, in speaking of a rampart or parapet, to signify a surface which is inclined to the horizon. Thus the upper surface of a parapet is called the superior talus or slope; and that surface of a rampart or parapet which is towards the country, or towards the town, is called the exterior talus or the interior talus of the work.

TAMANDUA. [Ant-Eater.]

TAMARICA'CEÆ, a small natural order belonging to the Syncarpous group of Polypetalous Exogens. The species are found only in the Old World; the greatest number being met with in the basin of the Mediterranean. The plants of this order are innocuous, and all are more or less astringent; and their ashes after burning are remarkable for possessing a large quantity of sulphate of soda.

TAMARINDS. Of the two species of the genus *Tamarindus* the fruit is much larger in the East Indian than the West Indian. The shell being removed, there remains the flat square hard seed, imbedded in a pulp, with membranous fibres running through it. In the East Indies the pulp is dried, either in the sun, and this is used for home consumption, or with salt added, and dried in copper ovens, which kind is sent to Europe. This sort, called natural tamarinds, is much darker and drier than the West Indian, which are called prepared tamarinds.

The West Indian tamarinds reach maturity in June, July, and August, when they are collected, and the shell being removed, they are put into jars, either with layers of sugar put between them, or boiling syrup poured over them, which penetrates to the bottom. Prepared tamarinds therefore contain much more saccharine matter than the others.

TAMARINDU'S, the name of a genus of plants belonging to the Rectembryous division of the natural order *Leguminosæ*. There are only two species belonging to this genus. The *Tamarindus Indica*, the East Indian Tamarind, was the earliest known species, for a knowledge of which, in Europe, we are indebted to the Arabians. The timber of this tree is very firm, hard, and heavy, and is applied to many useful purposes in building.

The second species is the *Tamarindus Occiden-*

talis, the West Indian Tamarind, which is a native of South America and the West India Islands, forming also a large spreading tree, with yellowish flowers streaked with red and purplish stamens.

TAMARIX, the name of a genus of plants, the type of the natural order *Tamaricaceæ*. *T. Gallica*, the French Tamarisk, is a native of France, and also along the Mediterranean: it is also a native of the coasts of Cornwall, Hampshire and Sussex, in England. Ehrenberg has described a great number of varieties of this species, one of which, the *T. G. mannifera*, he says, produces the manna of Mount Sinai. *T. Indica*, the Indian Tamarisk, a native of the East Indies, is subject to the attacks of a cynips, which produce galls that possess astringent properties, and, according to Dr. Royle, they are on this account used in medicine by the native doctors of India. *T. Africana*, the African Tamarisk, a native of the sands along the shores of the Mediterranean. It is found in Mauritiana, around the Bay of Naples, in Egypt, and in the Levant. It has very much the appearance of *T. Gallica*, but its flowers are larger, and bark darker. Like *T. Gallica*, its ashes yield a large quantity of sulphate of soda. The bark, as in most of the species, is slightly bitter and astringent, and has been used in medicine as a tonic. *T. Orientalis*, the Eastern Tamarisk, is one of the largest and most elegant of the species of the Tamarisk. One of the finest specimens of this tree existing is at Babylon. The *T. Chinensis* appears to be a variety of this plant.

Nearly all the species are elegant and delicate shrubs, deserving a prominent position in the shrubbery.

TAMAULIPAS. [Mexico.]

TAMBOW, a province of Russia, situated between 51° 30′ and 55° 20′ N. lat., 39° 40′ and 43° 10′ E. long., is bounded N. by Nischnei-Novgorod and Vladimir, S. by Voronesh, W. by Riasan, Tula, and Orel, and E. by Penza and Saratov. The area is 25,439 square miles, and the population in 1846 was 1,750,900, 9-10ths of whom are engaged in agriculture.

This government is a uniformly level country, without mountains, large rivers, or considerable lakes; on the north there are great forests, and on the south extensive steppes. The soil in the north is sandy, marshy, and poor; in the south it is very rich and fertile. The steppes produce excellent pasturage, and make good arable land. The river Oka, a feeder of the Volga, enters the government from Riasan, but passes only through one circle, where it is joined by the Mokscha, a considerable stream of which the Zna is a tributary. The Don crosses the western projection of the government. The mineral-waters at Lipezk are much frequented. The climate is temperate and healthy, but colder in winter than in Tula and Riasan. All kinds of corn usually grown in Russia are raised, rye, oats, millet, wheat, buckwheat, peas, and other pulse. Of the whole area, about 11,000,000 acres are said to be arable, of which one-third lies fallow, and the other two-thirds are sown with grain and oleaginous seeds, yielding a total of about 14,000,000 quarters annually; but a very small portion of this is wheat. Poppies, great quantities of hemp, some barley, and flax, are cultivated. Horticulture is in a very backward state; some hops and a little fruit are grown. Though the forests are so extensive, it is only in the northern circles that there is sufficient wood for fuel and building. The crown forests supply timber for the navy; in their vicinity the inhabitants are for the most part carpenters, coopers, and cartwrights, or employed in making pitch, tar, lamp-black, and charcoal. The steppes are covered with immense herds of oxen and horses. Oxen are used for draught, and great numbers are fattened for exportation. Sheep and swine are bred in great numbers, but the wool of the sheep is coarse. Among the wild animals are the marmot and the hamster. Game and fish are not plentiful. Great quantities of bees are kept. The mineral products are lime, freestone, iron, and some saltpetre.

The manufactures of this government are unimportant: the peasantry make their own clothing. Brandy-distilleries are numerous. The export trade is very considerable, consisting of grain, cattle, honey, tallow, butter, cheese, wool, hemp, iron, brandy, hides, and wooden wares.

Tambow, the capital of the government, is situated nearly in the centre of the province, on the Zna, in 52° 44′ N. lat., 41° 45′ E. long., and has 20,000 inhabitants. The town has been much improved since the beginning of this century. Almost all the houses are built of wood; the principal buildings are—the monastery of Our Lady of Casan, seven stone and six wooden churches, the gymnasium, and the civil hospital. There is a military school, a seminary for priests, and a district school. The bishop of Tambow resides in this city. The inhabitants manufacture shawls, kersey, sailcloth, cordage, and woollen cloth; and there is an Imperial alum and vitriol manufactory.

Jelatma, the most northerly town in the government, situated on the left bank of the Oka, carries on by means of that river a great trade with Moscow; the inhabitants, 6000 in number, manufacture woollen cloth, vitriol, and sulphur. *Koslow*, situated on the Lesnoi Woronesh, has above 8000 inhabitants; near the town is the convent Troitzkoi, where a great annual fair is held; the principal trade of the town is in oxen, salt meat, and hides. *Lipezk*, on the Woronesh, a town with 6500 inhabitants, is celebrated for its mineral-waters. *Morschansk*, a town of 6000 inhabitants, situated on the Zna, has manufactures of linen, sail-cloth, cordage, and tallow, and a brisk trade in corn, cattle, and honey.

TAMBURI'NI, PIETRO, born at Brescia, in 1737, studied in his native town, took holy orders, and was made professor of philosophy, and afterwards of theology, in the episcopal seminary of Brescia. After filling those chairs for twelve years, he was invited to Rome, where Clement XIV. made him director of the studies of the Irish College, in which situation he remained for six years. In 1778 the Empress Maria Theresa appointed him professor of theology in the university of Pavia, director of the studies of the German Hungarian College in that city, and censor of the

press. In 1795 he was made Professor Emeritus, with a pension. His chair of moral philosophy was suppressed for a short time, when he was appointed rector of the lyceum of his native town, Brescia. When Bonaparte assumed the government in France and North Italy, Tamburini was sent again to Pavia as professor of moral philosophy and of 'jus naturæ et gentium,' in which chair he continued for eighteen years, till some years after the Restoration, when the Emperor Francis made him again Professor Emeritus and præsul of the faculty of law and politics in the university of Pavia. Tamburini was also a knight of the order of the Iron Crown. He died at Pavia in March, 1827.

The work for which Tamburini is mostly known is 'Idea della Santa Sede,' published anonymously at Pavia, in 1784. Its object was to remedy the evils consequent upon the want of just and exact notions on the nature, the character, and the properties of the Holy See. The other works of Tamburini are 'Introduzione allo Studio della Filosofia Morale,' Milan, 1797; 'Lezioni di Filosofia Morale e di Naturale e Sociale Diritto,' 4 vols., Pavia, 1806-12; 'Elementa Juris Naturæ,' Milan, 1815; 'Cenni sulla Perfettibilità dell' Umana Famiglia,' Milan, 1823.

TAME. [STAFFORDSHIRE.]

TAMER. [CORNWALL; DEVONSHIRE.]

TAMERLANE. [TIMUR.]

TAMUS, the name of a genus of plants belonging to the natural order *Dioscoreaceæ*. *Tamus communis*, the Common Black Briony, is a frequent plant in England. The berries are not poisonous, although the whole plant contains a bitter acrid principle which renders it unwholesome.

TAMWORTH. [STAFFORDSHIRE.]

TANACE'TUM, a genus of plants belonging to the natural order *Compositæ*, and the suborder *Corymbiferæ* or *Asteraceæ*. The most common species is the *Tanacetum vulgare*, common *Tansy*. This plant is abundant in Great Britain and throughout Europe, on the borders of fields and road-sides. It possesses in a high degree the bitterness of the whole order *Compositæ*, which, in the section *Corymbiferæ*, is combined with a resinous principle. It is recommended and has been extensively used in medicine as an emmenagogue and anthelminthic.

TA'NAGERS, *Tanagrinæ*, a genus of Insessorial or Passerine Birds, characterised by Cuvier as having a conical bill, triangular at its base, slightly arched at its *arête*, and notched towards the end: wings and flight short. He observes that they resemble our sparrows in their habits, and seek for seeds as well as berries and insects. The greater part, he remarks, force themselves upon the attention of the spectator of an ornithological collection by their vivid colours. He places the genus between the Drongos (*Edolius*, Cuv.) and the Thrushes (*Turdus*, Linn.). [FRINGILLIDÆ.]

Mr. Swainson remarks that the *Tanagrinæ*, or *Tanagers*, form that group which is probably the most numerous, as it certainly is the most diversified, of all those in the comprehensive family of the *Fringillidæ*. As the dentirostral division of that family, it is, he observes, typically distinguished from all the others by the bill having a distinct and well-defined notch at the end of the upper mandible, the ridge or culmen of which is much more curved than the gonys; or, in other words, the culmen is more curved downwards than the gonys is upwards: this inequality, he further states, as in the genus *Ploceus*, very much takes off from that regular conic form of bill so highly characteristic of the greater number of the finches; so that the combination of these two characters is, he thinks, perhaps the best distinction of the whole group. Another peculiarity, he adds, of these birds consists in their geographic range; for the whole, as far as has hitherto been ascertained, are natives of the warmer parts of America, being most abundant in those regions nearest to the equinoctial line. 'They are,' says Mr. Swainson in continuation, 'in general small birds, the largest being intermediate between a sparrow and a thrush, while the majority do not exceed the size of a linnet; some few are even smaller. It is quite evident, from the great strength of bill possessed by some, and the notch which is conspicuous in all, that these birds feed upon seeds and creeping insects picked from the branches of trees, for very few of them are ever seen upon the ground. Their colours in general are bright; and, in a large number, particularly rich and beautiful. The little birds forming the genus *Aglaia*, in fact, are ornamented with the most vivid hues or glossed with rich reflections of gold, rendering them inferior only to the Humming Birds. Some possess considerable vocal powers; and the notes of the subgenus *Euphonia*, as its name implies, are said to be particularly musical. The impossibility however of providing the Tanagers with their native sweet food has prevented them from ever being brought alive to the European menageries, to which their beauty would render them the greatest ornaments.'

The genera are very numerous.—See Wilson's, Nuttall's, and Audubon's descriptions of the Scarlet Tanager, or Black-Winged Summer Red-Bird. (*Tanagra rubra*, Linn.).

TANARO. [CONI.]

TANGENT, the closest straight line which can be drawn to a curve through a given point of it. It is usually the line which meets the curve, and being produced does not cut it.

TANGHI'NIA, the name of a genus of plants belonging to the natural order *Apocynaceæ*. The specific name, *T. venenifera*, has been given to the plant which yields poison. In its native island of Madagascar this plant attains the size of a tree, and has a hard wood which may be used for many kinds of carpentry. But the part which yields the poison is the kernel of the fruit. Although this kernel is small, not much larger than an almond, Mr. Telfair says that it contains poison enough to kill twenty persons.

TANGIER. [MOROCCO.]

TANGUT, a country in Asia which occupies the centre of the eastern table-land of that continent. It borders on China Proper on the north-west, extending between 33° and 42° N. lat., and between 94° and 107° E. long. To the south of it is Tibet: to the west Chinese Turkistan.

The southern portion of Tangut, or that which lies south of 38° N. lat., is one of the most mountainous tracts on the globe, and extends over the upper course of the river Hoang-ho and the basin of the lake Khookhoo-nor. Three extensive mountain-ranges traverse it; and Tangut is separated from China Proper by a fourth range, the mountains of Sifan, which run south and north. Only a small portion of the countries enclosed by these mountain masses is fit for cultivation. The soil contains much saltpetre. The town of Ning-hia, the ancient capital of Tangut, is about 5 miles in circuit. It has some very good manufactures of carpets and paper, and considerable commerce with the nomadic tribes. Another town, Sining-tcheou, is not quite as large as Ning-hia, but a much more commercial place, as the road which connects northern China with Hlassa in Tibet passes through it.

The northern part of Tangut, with the exception of the valley of the Hoang-ho, is occupied by a wide desert plain, which constitutes a portion of the desert of Gobi. The mountains are however separated from the desert by a hilly tract from 30 to 50 miles wide, which contains some extensive tracts for cultivation, and in which some large towns have been built, as the great commercial route which connects China with the countries of Western Asia runs longitudinally through this hilly tract. To protect this hilly region, and the great commercial road which runs through it, against the nomadic tribes of the Gobi, the Chinese have continued the Great Wall along its northern border westward to 98° E. long. Among the towns in this great commercial route, the chief are Lan-tcheou, Liang-tcheou, Kan-tcheou-foo, and So-tcheou. So-tcheou is a large and well-fortified town, with numerous bazars, well provided with provisions and manufactured articles; it is divided into two sections, one of which is occupied by the Chinese, and the other by the foreign merchants from Bokhara and Turkistan. The towns hitherto noticed lie along the great caravan-road, but farther west the Chinese geographers mention other places of importance.

Our information respecting the climate of Tangut is very scanty. It is known however that the cold in winter is intense, and lasts for several months. The productions of Tangut are varied. Every kind of grain is grown in the few tracts whose soil is fit for cultivation, and rice is raised where irrigation is practicable. In the desert are numerous wild animals, such as wild hogs, deer, the argali, and hares.

The inhabitants of Tangut are a very mixed race. Mongol tribes inhabit the Gobi, and occupy also the mountain-ranges north of lake Khookhoo-nor, but the mountaineers who are in possession of the mountain region south of the lake derive their origin from Tibet. The agricultural population is mostly composed of Chinese and their descendants, among whom a small number of families of Turkish origin are settled. But in the towns the number of Turkish settlers seems to be considerable; they are Mohammedans, but the rest of the inhabitants are Buddhists.

The Chinese emperors subjected the country of Tangut probably during the dynasty of Han, shortly before the birth of Christ, and maintained their authority till the eighth century, when they were expelled by a Turkish race. The Tibetans held dominion over Tangut from the 8th to the 13th century, when it yielded to the Moguls. In 1690 Tangut was annexed to the empire of China.

TANJORE, a district in Southern Hindustan, was formerly a small independent kingdom or principality, and though now under British superintendence, is still governed by its Raja. The district is a part of the Carnatic, and is included in the presidency of Madras. It is bounded E. by the bay of Bengal, and extends from Point Calymere, 10° 18′ N. lat., to the mouth of the Coleroon, 11° 25′ N. lat. On the N. it is bounded by the Coleroon, W. by the district of Trichinopoli, and S. and S.W. by the sea and the territory of the Polygars.

The river Cavery, near Trichinopoli, separates into two branches, of which the northern is called the Coleroon, and falls into the sea a little to the north of Devicotta; the southern branch retains its name of Cavery. These two streams however, after flowing about 20 miles at some distance, again approach each other, and are only prevented by a narrow neck of land from re-uniting and discharging the whole river by the channel of the Coleroon. To prevent this junction large mounds have been formed, and are kept in repair at a considerable expense. The Cavery, thus separated from the Coleroon, flows through the flat territory of Tanjore, and divides into a number of smaller streams, which are conducted into reservoirs and canals for the purpose of irrigation: by this means nearly the whole district, which would otherwise be a sandy desert, is rendered one of the most fertile in Hindustan. From Devicotta to the salt swamp near Point Calymere, and from the bay of Bengal to the city of Tanjore, the whole country, with its rich covering of alluvial soil, has the appearance of a garden: from Tanjore to Trichinopoli it is like a desert.

The principal product of the district is rice, of which two crops are obtained annually; the next in importance is indigo: both are exported to Madras in considerable quantities, besides cocoanuts, grain, paddy, and lamp-oil.

The district of Tanjore has never been in the actual occupation of the Mohammedans. Its Hindoo religious structures are therefore uninjured, and in no part of Hindustan are they so numerous, so large, and so imposing. There is hardly a village without its brick pagoda and lofty gateway. Almost all the principal offices are in the hands of the Brahmins, and they are also the chief landholders.

TANJORE, the capital of the district of Tanjore, in 10° 47′ N. lat., and 79° 13′ E. long., is about 40 miles east from Trichinopoli, and about 57 miles west from the bay of Bengal, direct distances. The city is situated not far from the south bank of the Cavery, and is five or 6 miles in circumference, including the suburbs. It is a place of great strength, being defended by two forts, which are connected, and both are surrounded by walls built of large stones, and by

broad and deep wet ditches. The city is in a flourishing state: it is regularly built, and is said to contain a larger proportion of good houses than any other town in Southern Hindustan. The population is probably not less than 70,000 or 80,000. The palace of the Raja, where he resides, is in the larger fort. The pagodas of Tanjore are very large, with paved yards and extensive gardens; one of the largest in Hindustan is situated in the smaller fort. [HINDUSTAN, vii., 231.] The Protestant Mission church was built at the expense of the missionary Schwarz; it is a spacious and handsome structure.

TANNAHILL, ROBERT, born at Paisley, in Scotland, June 3, 1774, was the son of poor parents, by whom he was brought up to the occupation of a weaver, which he pursued in his native town and at Glasgow throughout the short period of his life. The earliest predilection of Tannahill was for poetry, and his taste was formed by the study of Allan Ramsay, Fergusson, and Burns. 'Jessy, the flower of Dumblane,' is his best-known effort.

Tannahill committed suicide by drowning himself in 1810. His songs were published in Paisley, in his lifetime, in a small volume; and since, with additions and a life, edited by Ramsay.

TANNER, THOMAS, was the eldest son of the Rev. T. Tanner, vicar of Market Lavington, Wiltshire, where he was born, Jan. 25, 1674. In November 1689 he was entered a student of Queen's College, Oxford; but after having taken his degree of B.A., he removed in Jan., 1694, to All Souls, and was elected a fellow of that society, Nov. 2, 1696. Anthony à Wood, at his death in 1695, left his papers to Tanner's care. That same year Tanner published at London his first work, an 8vo. volume entitled 'Notitia Monastica, or a Short Account of the Religious Houses in England and Wales.' Having taken orders, he was appointed by Dr. Moore, bishop of Norwich, one of his chaplains; and having, in 1701, married the eldest daughter of that prelate, he received various preferments from his father-in-law. In 1706 his wife died, and in that year he was presented by a friend to the rectory of Thorp, near Norwich; and he then married a daughter of J. Preston, Esq., of London. His next publication, a new edition of Wood's 'Athenæ Oxonienses,' enlarged by the addition of 500 new lives from Wood's manuscripts, appeared at London, in 2 vols. fol., in 1721. In Dec. of that year Tanner, who had taken his degree of D.D. in 1710, was appointed to the archdeaconry of Norfolk; and in 1723 he was appointed canon of Christ's Church, Oxford. He was consecrated to the bishopric of St. Asaph, in Jan., 1732; and died at Oxford, Dec. 14, 1735. Tanner's literary reputation rests principally on his great biographical and bibliographical work, entitled 'Bibliotheca Britannico-Hibernica, sive de Scriptoribus qui in Angliâ, Scotiâ, et Hiberniâ, ad Sæculi xvii. Initium floruerunt, Literarum Ordine, juxta Familiarum Nomina, dispositis, Commentarius,' which had been the labour of his leisure for forty years, and which was published, in folio, at London, in 1748, under the care of the Rev. Dr. David Wilkins.

TANNIC ACID, or TANNIN, a peculiar vegetable acid existing in every part of each species of *Quercus*, but especially in the bark: it is found however in the greatest quantity in the gall-nut. The name of this substance is derived from its property of combining with the skins of animals in tanning, by which they are rendered impervious to water, and prevented from putrefying. Tannic acid is a colourless or slightly-yellowish mass, which does not crystallise, but resembles dried gum. It is readily soluble in water. When dried at 212° Fahr. it consists of C^{18} H^{5} O^{9}, with three equivalents of water, which are however expelled at a temperature of 240°.

Tannic acid combines with the alkalies to form salts, which are called *Tannates*, and it precipitates most metallic oxides from solution. Tannate of peroxide of iron, formed by the action of the acid on a persalt of the metal, is the basis of writing-ink, and is a black pulverulent precipitate.

It has been shown by Mr. Hatchett, that when powdered charcoal has been digested for a considerable time in dilute nitric acid, it is dissolved, and a reddish-coloured liquid is obtained, which by careful evaporation yields a brown glossy substance, amounting to about 120 parts from every 100 of charcoal employed. This substance has been called *Artificial Tannin*. Its taste is astringent and bitter; it is soluble in water and in alcohol, and forms with a solution of gelatin an insoluble precipitate.

Tannin has been long known as the active principle in almost all astringent vegetables. As many of these are powerful in restraining excessive discharges, whether bloody or otherwise, it was conjectured that the pure principle would be yet more efficacious than when in a state of combination. Accordingly it has been administered in some passive hæmorrhages, chiefly from the uterus and the bronchial tubes.

TANNIN. [TANNIC ACID.]

TANNING is the process of converting the skins of animals into leather, by effecting a chemical combination between the gelatin of which they principally consist, and the astringent vegetable principle called *Tannin*.

The larger and heavier skins operated upon by the tanner, as those of bulls, buffaloes, oxen, and cows, are technically distinguished as *hides*; while the name *skins* is applied to those of smaller animals, as calves, sheep, and goats. The process necessary to convert hides into the thick hard leather used for the soles of boots and shoes is as follows:—The horns are removed from the hides; and the latter are scraped, steeped, and sweated, and the hair removed. The hides are then immersed for a few days in a liquid which opens the pores and fits them for the action of the tanning ingredients.

In the old method of tanning, which is not yet entirely abandoned, the hides and powdered bark were laid in alternate layers in the tan-pit, which was then filled with water to the brim. After some months the pit was emptied and re-filled with fresh bark and water, and this process was repeated whenever the strength of the bark was exhausted. In this way the time required for

impregnating the hides varied, according to their thickness and other circumstances, from one to four years. The process has been expedited by the use of a concentrated solution of bark instead of mere layers of bark in water. The variations of practice among different tanners extend to the substance used as an astringent, as well as to the manner of applying it. Ground oak-bark, which was formerly the only material in common use, and is still the most general, produces good leather of a light-fawn colour. Valonia, of which considerable quantities are imported for the use of tanners, produces leather of great solidity and weight, the colour of which is inclined to gray, and which is more impervious to water than that made with oak-bark. Catechu, or Terra Japonica, the inspissated extract of the *Acacia Catechu*, produces leather of a dark reddish fawn colour, which is light, spongy, and very pervious to water. Another substance which has been used of late years is a kind of bean-pod called *divi-divi*. These substances may be used either individually or in various combinations; and they are prepared with plain water or with ooze, with hot water or with cold, according to the judgment of the tanner. In whichever way the tanning is effected, the hide is subjected to the action of solutions increasing progressively in strength, until it is so perfectly penetrated, that when cut through it presents a uniform brown colour; any appearance of a light streak in the middle of its thickness being an indication of imperfect tanning. When the process is complete, the hides are hung up in a shed, and allowed to dry slowly; and, while they are drying, they are compressed by heating or rubbing, or by passing them between rollers, to give them firmness and density.

Several schemes have been devised for forcing a tanning solution through the pores of the hide by mechanical pressure. Mr. Spilsbury patented a method of forcing the tan liquor into the pores of the hide by hydrostatic pressure, but in a mode which was found to produce leather of unequal quality. Another process, by Mr. Drake, consisted in sewing two skins together (after they had received a slight tanning in the ordinary way), so as to form a water-tight bag, which was filled with tan-liquor, and compressed so as to force the liquor through the skin. In another plan, which has been tried under several forms, the tanning liquid is applied to both sides of the hides, which are placed in an air-tight vessel, and is forced into their pores by hydrostatic pressure, the air being previously pumped out. In the plan patented by Messrs. Hempath and Cox of Bristol, a number of hides are connected together by strings, so as to form a continuous belt, and passed between rollers turned by steam or other power; there are several pairs of rollers, each pair erected over a pit. The pits contain tanning liquors of different degrees of strength. The hides are dipped first in the weakest liquor and so on to the strongest, passing between and being compressed by the rollers after each dipping. This process is said greatly to expedite the conversion of hide into leather; but it is not yet settled whether the leather is of quality equal to that prepared by the old method.

The thinner hides or skins for the upper leathers of boots and shoes are tanned with the same materials as the thicker, but by a quicker and less elaborate process. The process of *Currying*, and the finishing processes generally, are noticed under LEATHER.

Of the thin skins prepared for ornamental purposes, many are tanned with a substance called sumach, prepared from a plant of the same name. After a preparatory cleansing, &c., the goat-skins for morocco leather are sewed up into the form of a bag, with the grain or hair-side outwards; they are nearly filled with a solution of sumach, inflated with air, the aperture tied up, and the bags then thrown into a cistern of hot sumach liquor. Being thus acted on, both within and without, the skins are soon impregnated with sumach. The bags are then opened, the liquor removed, and the skins washed, rubbed, dried, dyed, and wrinkled by pressure with a grooved instrument. Cheap or imitation morocco is made of sheep-skins.

Tawing is the name applied to the process by which the skins of sheep, lambs, and kids, are converted into soft leather by the action of alum. Of this kind of leather gloves are usually made. Skins intended for tawing pass through a series of operations resembling those by which skins are prepared for tanning; but the tawing materials consist of alum, salt, flour, and yolk of eggs (chiefly the first two), which are applied in various ways. The skins require a great deal of stretching and rubbing after the steeping, to give them the requisite softness.

In making *Chamois Leather*, or *Shamoyed Leather*, of which wash-leather is a cheap example, the skins of deer, goats, and sheep, are impregnated with oil instead of with the ingredients hitherto mentioned. After a certain preparation, the skins are beaten for many hours with heavy wooden machines, and cod-oil is forced into the pores.

TANTA'LIDÆ, a family of Wading Birds. [GRALLATORES.]

Cuvier places the genus *Tantalus* between the *Openbeaks* (*Hians*, Lacép.; *Anastomus*, Ill.) and the *Spoonbills* (*Platalea*, Linn.). He characterises the genus as having the feet, the nostrils, and the bill of a stork; but the back of the bill is, he observes, rounded, and its point curved downwards and slightly notched on each side: a portion of the head, and sometimes of the neck, is, he adds, denuded of feathers. He notices the following species: the American Tantalus (*Tantalus loculator*, Linn.); the African Tantalus (*Tantalus Ibis*, Linn.); and the Ceylonese Ibis (*Tantalus leucocephalus*), the largest of all.

For an account of the *Tantalus Ibis*, *Tantalus Æthiopicus*, Latham, *Ibis religiosa*, Cuvier, see ABOU-HANNES.

TAORMINA. [MESSINA; TAUROMENIUM.]

TAPESTRY, BAYEUX. [BAYEUX TAPESTRY.]

TAPIO'CA, a farinaceous substance, prepared in South America from two species of *Janipha*, or the bitter and sweet Cassada or Manoic plants, which two were long regarded as one species, and comprehended under the name of *Jatropha Manihot*, till Pohl distinguished them, calling the

bitter *Manihot utilissima*, and the sweet *Manihot Aipi*. Though the bitter contains a highly acrid and poisonous juice, from which the sweet is exempt, yet the bitter is cultivated almost to the entire exclusion of the other, which is probably owing to the greater facility with which it can be ground or rasped into flour. The poisonous principle of the bitter manioc is thought to be of the nature of hydrocyanic acid. It is easily dissipated or decomposed by heat or fermentation; hence the flour becomes perfectly wholesome in the process of baking the cassava bread. The fecula, or flour, after the juice has been carefully expressed, is washed, and dried in the air without heat. This constituted the Brazilian arrow-root of English commerce. When this fecula is prepared by drying on hot plates, it becomes granular, and is called *Tapioca*. It occurs in irregular lumps or grains, and is partially soluble in cold water.

TAPIR, *Tapirus*, the name of a genus of Pachydermatous Quadrupeds, the living species of which, strange to say, are divided between America and certain of the Indian Islands, including also the Malay Peninsula. There are very few existing indigenous Pachydermata in America, and of these few the Tapir is the largest and the heaviest, but in the Old World the Tapir cannot be placed in competition with the Elephant, the Rhinoceros, or the Hippopotamus.

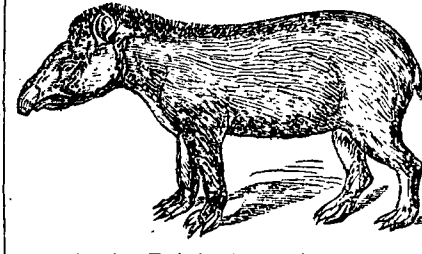
The leading characters of the genus *Tapirus* may be summed up as follows:—

Contour massive, but low; skin thick, covered with short, close, but not very harsh hair. Head conical, eyes small, ears short, arch of the neck uplifted, and exhibiting a powerful *ligamentum nuchæ*. Muzzle produced into a short, but moveable proboscis, endowed with considerable flexibility and sense of touch. Molars presenting on their crown before they are worn two transverse and rectilineal elevations; mammæ, two, inguinal. Anterior feet with 4 toes, posterior with 3. Senses of hearing, sight, and smell, acute.

Incisors, $\frac{6}{6}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{7-7}{6-6}=42$.

To this we may add, that the eyes are small and deeply set; the tail rudimentary; the head large and compressed, the tips of the toes cased in hoofs. Canines small.

Of the American Tapirs, two species are known, one of which, the Common American Tapir (*T. Americanus*), is very extensively spread throughout the warmer regions of South America, but especially between the tropics, where it inhabits deep forests, leading a solitary life, and seldom stirring from its retreat during the day, which it passes in a state of tranquil slumber. During the night, its season of activity, it wanders forth in quest of food, which consists of water-melons, gourds, young shoots of brushwood, &c. Its choice of food is not very limited, and indeed it appears to be as omnivorous as the hog. Azara affirms that it devours the nitrous earth of Paraguay, and that he has found a quantity of this substance in the stomach. Its senses of smell and hearing are extremely acute, and serve to give it notice of the approach of enemies. Its voice, which it seldom utters, is a shrill kind of whistle, in strange contrast with the massive bulk of the animal. Of enormous muscular power, and defended by a tough thick hide, the Tapir is capable of tearing its way through the underwood in whatsoever direction it pleases. When thus driving onwards, it carries its head low, and, as it were, ploughs its course. Its fondness for the water is almost as strong as that evinced by the Hippopotamus; it swims and dives admirably, and will remain submerged for some minutes, then rise for a moment to the surface in order to take in a fresh supply of air, and plunge again.



American Tapir (*Tapirus Americanus*).

The Tapir is easily domesticated, and becomes as quiet and familiar as the hog. The female produces, we believe, only one offspring at a birth, but we do not speak positively. The chief natural foe of this beast is the jaguar, but the latter is by no means always the victor. The young are longitudinally marked with spots, and six or eight bands of fawn colour along the body, and with numerous spots of the same tint on the cheeks. The adult is of a uniform deep blackish-brown. Height between 3 and 4 feet.

The other American species (*Tapirus Roulinii*) is a native of the Cordilleras of the Andes, where it was discovered by Dr. Roulin; it is covered with long, thick, black hair. Cuvier regards it as approaching in some respects to the fossil genus *Palæotherium*. Little is known respecting this animal.

The Malay or Indian Tapir (*Tapirus Indicus*, Farquhar) was first introduced to science by Major Farquhar in 1816. It is a native of Sumatra and the Malay Peninsula. Its habits and manners agree with those of the Common American Tapir. Its colour is singular. The head, neck, fore-limbs, and fore-quarters are quite black; the body then becomes suddenly white or grayish white, and so continues half way over the hind-quarters, when the black again commences abruptly, and is spread over the legs. The young, until the age of four months, are black, beautifully marked with spots and stripes of fawn colour above, and white below. Snout longer than in the American species, and more proboscis-like; larger in size; no mane.

Fossil Tapirs.—Dr. Buckland in his 'Reliquiæ Diluvianæ,' notices the remains of Tapir in company with those of rhinoceros, elephant, horse, ox, deer, hyæna, bear, tiger, fox, wolf, mastodon, hog, and beaver, in the Val d'Arno, on the authority of Mr. Pentland; and in his interesting and instructive first plate illustrative of his 'Bridgewater

Treatise' figures a Tapir in little among the mammalia of the first period of the Tertiary series (Eocene of Lyell). In the Epplesheim Sand (Miocene of Lyell), Professor Kaup found two species larger than those now living.

(*Trans. of the Asiatic Society,* vol. xv., 1820; Yarrell, in *Zool. Journal,* vol. iv.; Lieut. Maw's *Journal,* &c.; Bennett, in *Gardens and Menagery of Zool. Soc.,* &c.)

TAPPING, or *Paracentésis* (in Surgery), is the operation usually employed for the removal of fluid from any of the serous cavities of the body in which it has collected in a dangerous quantity. It is accomplished by means of an instrument called a trocar, and a tube, or canula, in which it exactly fits. The trocar is of steel, cylindrical through the chief part of its length, and terminated by a three-sided pyramid which ends in a very sharp point. The canula being placed upon its shaft, the trocar is thrust into the cavity containing the fluid, and being then withdrawn through the canula, the latter is retained in the aperture till all the fluid is discharged. The diseases for which tapping is chiefly performed are ascites, hydrothorax, hydrocele, and, occasionally, hydrocephalus, and effusions of fluid in the pericardium.

TAPTY. [Hindustan, vii. 202.]

TAR is obtained from wood or coal by distillation in close vessels, or in piles from which the air is excluded. *Pitch* is obtained by boiling tar until all the volatile matters are driven off. Tar is a viscid brown semi-fluid mass, which long preserves its softness. If it be mixed with water, the water acquires a yellow colour and the taste of tar, with slightly acid properties. This solution is well known by the name of Tar-Water, and has been used in medicine. Tar is soluble in alcohol, in æther, and in the fixed and volatile oils. Oil of Tar, Creasote, and many other valuable substances, are obtained from tar.

Tar is extensively manufactured from the roots and branches of pines and firs in Norway, Sweden, Germany, Russia, North America, and other countries in which those trees abound; but that made in the north of Europe is considered far superior to what is produced in the United States. A conical cavity is made in the ground (generally in the side of a bank or sloping hill), and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, which is well beaten down. The stack of billets is kindled, and a slow combustion of the fir takes place, without flame, as in making charcoal. During this combustion the tar exudes; and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged and made ready for exportation.

In some parts of France and Switzerland tar is extracted in a kind of oven or kiln, built of stone or brick, in the form of an egg, with its smaller end downwards.

As England requires a large quantity of tar for the navy, the supply from foreign countries is an important matter. At different periods, the high price of Swedish tar has led to the encouragement by government of the making of tar in the British American colonies. During the American war, attention was paid to the establishment of the manufacture of tar from pitcoal, an object which had been previously attempted; but the manufacture of coal-tar has not proved so important as was at one time anticipated, although for some purposes it is deemed superior to that made from wood. Tar is produced in large quantities in the manufacture of coal-gas; but in some districts its value is considered so trifling that it is mixed with the fuel by which the retorts are heated. It is usually separated from the gas by condensation. The quantity of tar imported in 1848 amounted to 12,754 lasts (about 5,000,000 gallons). It is now admitted duty free.

TARAKAI is a large island, which extends along the eastern coast of Asia between 142° and 145° E. long., and is separated from the continent by the Gulf of Tartary, a strait varying from 40 to 200 miles in width. Tarakai, which is separated on the south from the Japanese island of Yeso by the strait of La Perouse, and is bounded on the east and north by the sea of Okhotsk, has, at various times, received the names of Saghalien, Tchoka, Karafto, and Sandan. It extends from 46° to 54° 20′ N. lat., about 600 miles, with a width varying from 25 to 120 miles.

Though the coast is of great extent and much indented, it does not appear that there are many good harbours; the best are Aniva Bay, Patience Bay, and Northern Bay. The island is naturally divided into three tracts: the mountainous, which occupies the southern portion; the level, in the middle; and the hilly tract, which extends over the northern districts. The mountain-region is the largest, and comprehends more than one-half of the island; it has many summits, about 5000 feet in height. The middle, or low region, is partly sandy and partly swampy. The hilly-region has clusters of hills clothed with trees to their summits, and valleys of much fertility.

The climate is somewhat cold and foggy. No kind of grain is cultivated, not even round the settlements of the Japanese, nor are orchards or kitchen-gardens mentioned. The inhabitants however derive profit from the spontaneous products of the soil; for both fruits and trees abound. Land animals are not numerous.

The inhabitants are aborigines, among whom a few Japanese have settled on the Bay of Aniva, and a few Mantchoos on the Northern Bay. The aborigines constitute a nation which extends along much of the neighbouring continent and islands.

TARANTASIA. [Savoy.]

TARANTISMUS is the name given to a peculiar nervous affection which was long supposed to be the consequence of the bite of the Tarantula Spider. It seems to have occurred frequently in the kingdom of Naples during the 16*th* century, and to have been nearly similar in its characters to the disease which was originally called St. Vitus's Dance. [Chorea.]

This affection is purely nervous, and it is

now known not to be dependent in any manner on the bite of the Tarantula. It does not appear that the bite of this or any other spider is venomous.

TA'RANTO, a town of Apulia, in the Neapolitan province of Terra d'Otranto, is the seat of an archbishop, and contains 18,000 inhabitants. It occupies a small part of the site of ancient Tarentum, of which there are few remains. The town, which stands at the head of the Gulf of Taranto, on an island joined to the mainland by two stone bridges, is pretty well built; it is fortified, and has a castle, several churches, and convents. It carries on some trade by sea in small craft. Some linen, cotton, muslin, and velvet, are manufactured. A part of the population is employed in fishing. Excellent oysters are found on the coast. The inner port is nearly filled up, but the outer or large port is accessible to vessels of good size, and is protected by two islands situated at its mouth. Much wool is produced in the neighbourhood of Taranto. Two lagunes, which lie S.E. of the town, communicate with the sea, and yield a great quantity of salt by evaporation.

Tarentum, the *Taras* of the Greeks, was the principal Greek city on the east coast of Italy. It is said to have been a town of the Messapians, to which were joined some Cretan colonists from the neighbouring town of Uria. About 694 B.C. the Partheniæ, under Phalantus, arrived on the coast of Iapygia, took Tarentum, and expelled the original inhabitants. (Justin, iii. 4.) A war between the Tarentines and the Iapygians ensued, in which the people of Rhegium assisted the Tarentines, but they were defeated by the Iapygians, who destroyed a great number of the Tarentines. (Diodorus, xi.) Tarentum however recovered from its losses; it flourished by commerce, acquired a considerable extent of territory, and became the most powerful city of Magna Græcia. (Herodotus, iii., 136; Strabo, vi. 193.)

About 338 B.C. the Tarentines, being engaged in war with their neighbours the Lucanians, applied to Sparta for assistance. Archidamus, the son of Agesilaus, was sent to them, and he was killed in fighting on their side. Some years after, being hard pressed by the Lucanians and Bruttii, the Tarentines applied to Alexander, king of Epirus, and uncle to Alexander the Great. He came to Italy with troops, obtained considerable advantages, but was at last surprised and killed by the Bruttii, near Pandosia, B.C. 323. (Justin, xii. 2; Livy, viii. 24.) The Tarentines afterwards formed an alliance against Rome with Pyrrhus, who sent troops to assist them, but ineffectually, as Tarentum was taken by the consul L. Papirius Cursor. The Tarentines however were placed by the Romans in the condition of allies; but, dissatisfied with their condition, they entered into a negociation with Hannibal, after the battle of Cannæ, and in the year 212 B.C. his troops were admitted into the city. In 209 B.C. however the consul Q. Fabius Maximus retook Tarentum by surprise. (Livy, xxv. 7, 11; xxvi. 39; and xxvii. 15, 16.)

TARA'NTULA, the *Aranea tarantula* of Linnæus, a species of spider of the genus *Lycosa* of Latreille. It is one of the largest of European spiders, and is found in the countries bordering the Mediterranean, where its bite is dreaded, and believed to be curable only through the effects of music. In reality however it is doubtful if it is at all venomous. According to Walckenaer, several distinct species have been confounded under the name of *Tarantula*.

TARARE. [RHÔNE.]

TARASCON. [ARIE'GE.]

TARASCON-SUR-RHONE. [BOUCHES-DU-RHÔNE.]

TARAZO'NA, the ancient *Turiaso*, is situated at the foot of the Moncayo, on the Queiles, in 41° 55′ N. lat., 2° 4′ W. long., and has 10,000 inhabitants. Tarazona is the see of a bishop, who is suffragan of Saragossa. The town is badly built, and the streets narrow and crooked. With the exception of the cathedral, a fine Gothic pile erected in the 13th century, there is no building worth notice. (Miñano 'Diccionario Geografico.') There is another Tarazona in CASTILLA-LA-VIEJA.

TARBERT. [KERRY.]

TARBES. [PYRENE'ES, HAUTES.]

TARBOLTON. [AYRSHIRE.]

TARDI'GRADA, Cuvier's name for the first family of the *Edentata*, comprising, of living genera, the Sloths only. The *Tardigrada* form the eighth order in Illiger's method, and comprise the Sloths and *Prochilus*; but the latter cannot be said to have any claim to such a collocation.

TARDI'VOLA, Mr Swainson's name for a genus of the subfamily *Tanagrinæ*. Example, *Tardivola sphenura*. [TANAGERS.]

TARE. We hardly know whether all the words *tare*, *tret*, *cloff*, *suttle*, *gross*, *net*, are still used in commerce; they all hold their places in works of arithmetic. *Tare* is said to be the allowance for the weight of the box or bag in which goods are packed; *tret*, an allowance of 4lb. in 104lb. for waste; *cloff*, an allowance of 2lb. in 3 cwt., that the weight may hold good when sold by retail; the *gross* weight, that of the goods and package all together; the *suttle* weight, that which remains when tare only is allowed; the *net* weight, that which remains when all allowances are made.

TARENTUM. [TARANTO.]

TARES, or *Vetches*, are a very important green crop in the improved systems of agriculture, especially on heavy soils, where they thrive best. When sown in autumn, with a small sprinkling of wheat or rye, they cover the ground in spring, and supply abundance of fodder in summer. A good crop of tares is fully equal in value, if not superior, to one of red clover: it comes off the ground in sufficient time to give the land a hasty summer tillage, which is so useful in destroying weeds, and to allow turnips to be sown in the same season. They smother annual weeds if the crop is plentiful, which should always be secured by an abundant manuring; thus they are a good substitute for a summer fallow in heavy soils, and amply repay the labour and manure bestowed upon them.

There are many species and varieties of tares; but that which is found the best adapted for agricultural purposes is the Common Tare (*Vicia sativa*), of which there are two principal varieties, very slightly differing in appearance, one of which is hardy, and will stand the severest winters: the other is more tender, and is therefore only sown in spring; but it has the advantage of vegetating more rapidly, so that spring tares sown in March will be fit to cut within a fortnight or three weeks after those which were sown in autumn. By sowing them at regular intervals from September to May, a succession of green tares in perfection, that is, in bloom, or when the pods are formed, may be cut for several months, from May to October. A prudent farmer arranges his crops so that he shall have artificial green food for his horses and cattle at least six months in the year, by having tares fit to cut between the first and second cut of clover. When there are more tares than is absolutely required for this purpose, and the weather permits, they make excellent hay; or, if the weather is not favourable, they are cut and given to sheep, which are folded on the portion already cut.

TARGUMS, or *Chaldee Paraphrases of the Old Testament.* During the Babylonish captivity the language of the Jews was affected by the Chaldee dialect spoken at Babylon, to such an extent, that upon their return they could not understand the pure Hebrew of their sacred books; and therefore, when Ezra and the Levites read the law to the people, they found themselves obliged to add an explanation of it, undoubtedly in Chaldee (Nehem., viii. 8). In course of time such explanations were committed to writing, and from their being not simple versions, but explanatory paraphrases, they were called by the Chaldee word *Targum*, which signifies 'an explanation.' There are ten Targums extant, of which that of Onkelos on the Pentateuch is the most ancient. Taken together the Targums form a paraphrase of the whole of the Old Testament, except the books of Daniel, Ezra, and Nehemiah, for which such an exposition was the less necessary, as they are to a great extent written in Chaldee.

TARI'FA, a fortified and seaport town of Spain, situated in the narrowest part of the Strait of Gibraltar, on a point of land projecting into the sea; in 36° 3′ N. lat., 5° 36′ W. long., and has about 12,000 inhabitants. It takes its name from the Moorish leader Tarif Ibn Malek, who landed on the little island facing the port (now joined by a causeway to the mainland) with a small force in the year 711. In 1295 it was besieged by the Moors under Abú Yúsuf, but it was stoutly defended by Don Alonso Perez de Guzman, who would not surrender it notwithstanding they threatened to behead his only son, which they did before his eyes. In 1340 a great battle was fought near Tarifa, between Alphonso XI. of Castile and Abú-l-hasan, sultan of Fez and Marocco, when the former was victorious. The French attacked it without success in 1811 and 1812; but they took possession of it in the expedition of 1823. The inhabitants are engaged chiefly in tunny fishing and the coasting trade.

TARIFF, a table of duties payable on goods imported into or exported from a country.

TARLTON, RICHARD, was born in Shropshire. The date of his birth is not known. He died in 1588, and was buried (Sept. 3) at St. Leonard's, Shoreditch, London.

Tarlton was distinguished for his performance of the clowns of the old English drama, in which he is spoken of as having been unrivalled, and seems besides to have been one of those clowns who spoke 'more than was set down for them.' One of Tarlton's last performances was in 'The Famous Victories of Henry V.;' this was in 1588, at the Bull in Bishopsgate Street.

Tarlton is known to have written at least one play, 'The Seven Deadly Sins,' which, though never printed, and now lost, was much admired. There is a portrait of Tarlton, in his clown's dress, with his pipe and tabor, in the Harl. MS. 3885; and a similar one in the title-page of a pamphlet called 'Tarlton's Jests,' 4to., 1611. A copy of the former portrait is given in Knight's 'Pictorial Shakspere,' at the end of 'Twelfth Night.'

TARN, a department in France formed out of portions of Haut-Languedoc, and named from the river Tarn, which crosses it from E. to W., is bounded N.W., N., and N.E. by Tarn-et-Garonne and Aveyron, E. by Aveyron and Hérault, S. by Aude, and W. by Haute-Garonne. Its greatest length is 66 miles; the average width is about 44. The surface measures 2216 square miles, and the population in 1846 was 360,679, which gives 162.76 to the square mile, being 10.99 below the average per square mile for the whole of France.

The department lies entirely in the basin of the Garonne. A chain of mountains traverses the northern part of it in a direction parallel to the course of the Tarn, along the southern bank of which a similar but lower range runs. Along the southern border runs the crest of the Montagne Noire, a branch of the Cévennes, from which range another projection (the Sidobre) running E. and W. separates the waters of the Adou from those of the Agout in the upper part of their course. The highlands of the department generally terminate in flat summits, and their declivities, as well as the numerous isolated hills that stud the surface, are capable of cultivation. The only exceptions to this are the arid rocky range that approaches the Aveyron on the northern boundary and the higher parts of the Sidobre range. The other general features of the department are numerous, deep, narrow valleys, drained by rapid streams which form waterfalls, and in the centre and west fertile plains of considerable extent.

The chief river is the *Tarn*, which rises in the department of Lozère, and on the southern slope of Mont Lozère in the arrondissement of Florac. Crossing the south of the department of Lozère first in a westerly, then in a south-western direction, the Tarn traverses those of Aveyron and Tarn in a course W. by S., passing Milhau, Alby, Gaillac, and L'Isle, below which it enters Haute-Garonne, but almost immediately wheeling to the N.W. leaves this department and enters that of Tarn-et-Garonne, where, having passed Montauban and Moissac, it throws itself into the

Garonne on the right bank, after a course of 215 miles, only 78 of which, from Alby to its mouth, are navigable. The Tarn flows in a very deep bed, bordered by high banks. It is subject to floods at the season when the snows melt on the mountains. Its principal feeder in this department is the Agout, which, swelled by the Sor and the Adou, drains all the south of the department, and enters the Tarn on the western boundary. The Aveyron and its feeder the Viaur, form a considerable portion of the northern boundary. The other affluents of the Tarn—the Dourbie, the Sorgues, the Rance, on the left; and the Aveyron on the right—are noticed under AVEYRON. About 4 miles E. of Alby is the Saut-du-Sabot, a series of rapids by which the Tarn makes a descent of 60 feet.

The soil of the plains, valleys, and lower slopes is good, yielding in the south and west, with improved cultivation, abundant crops of wheat, maize, rye, hemp, flax, some woad, anise-seed, fruits, pulse of all kinds, and potatoes. In the valley of the Tarn the system of farming is bad, but the soil is very rich. On the highlands the products are hemp, rye, oats, buckwheat, chestnuts, walnuts, and timber. The breadstuffs raised exceed the home consumption. The vineyards, on the management of which great care and pains are bestowed, yield annually about 8,360,000 gallons of good wine, one-half of which is consumed on the spot or converted into brandy, and the rest is exported. The pastures on the hill sides and in the valleys are good, so that many sheep, horned cattle, and pigs, are reared. A good breed of light horses prevails; the fed calves and poultry of the department are in good repute; bees are very carefully tended; and silkworms are reared, but not so extensively as they might be. The forests, which are of considerable extent, consist of oak, beech, ash, and maple. The cultivated trees are principally chestnut, walnut, cherry, some mulberry and olive trees.

The climate, except in the narrow valleys, where fogs sometimes prevail, is genial and healthy. Winter lasts from mid-December to mid-February, and at the maximum winter cold Fahrenheit's thermometer marks 18.5°. Spring lasts but a short time; April and May are not unfrequently warmer than June. The greatest summer heat in July and August ranges between 88.25° and 104°, the highest temperature experienced during the hottest summer. The autumns are long and delightful. The prevailing winds are west, northwest, and east.

The mineral wealth of the department includes iron, lead, copper, coal, manganese, marble, gypsum, and potters' clay.

The chief manufactures are woollen cloths, flannel, serge, table linen, canvass, woollen hosiery, cotton cloths, silk and cotton yarn, liqueurs, confectionary, &c. There are numerous brandy distilleries, copper foundries, iron and steel works, glass-works, paper-mills, tan-yards, and dye-houses.

The surface of the department measures 1,418,379 acres, distributed among 92,265 proprietors, and into 1,011,885 parcels. Of this area 806,606 acres are arable land; 103,412 are pasture and meadow; 77,206 acres are laid out in vineyards; 215,679 are covered with woods and forests; 151,824 acres are heath and moor; 26,713 acres are occupied with gardens, nurseries, orchards, and various culture; 23,987 with roads, streets, &c.; and 9726 acres with houses, public buildings, and cemeteries.

The department is divided into 4 arrondissements, which, with their subdivisions and population, are as follows:—

Arronds.	Cantons.	Communes.	Pop. in 1846.
Alby . . .	8	91	91,232
Castres . . .	14	92	143,743
Gaillac . . .	7	75	72,422
Lavaur . . .	6	57	53,282
Total . .	35	315	360,679

Of the arrondissement of Alby, and of the whole department, the chief town is ALBY. *Pampelonne*, 16 miles N. from Alby, has a population of 2025. *Réalmont*, 10 miles S. from Alby, is a well-built town surrounded by handsome public walks, and consisting of several straight streets that abut on a central square. The entrance to the town is by shady avenues of fine trees. The inhabitants, who number 2819, manufacture coarse woollens, crape, serge, and linen.

The arrondissement of Castres is named from its chief town CASTRES. *St.-Amans-la-Bastide*, 16 miles from Castres, is situated on the northern slope of the Montagne Noire on the Thoré, a feeder of the Agout, and has 2353 inhabitants, who manufacture cloth, woollen yarn, and caps. *Angles*, 14 miles E. from Castres, has cotton and woollen manufactures, and 2785 inhabitants. *Brassac*, in a pretty valley on the Agout, has 2055 inhabitants. *Dourgne*, 12 miles S. from Castres, has coarse-woollen manufactures, marble quarries, and 2250 inhabitants. *Labruguière*, a well-built little town on the left bank of the Thoré, has a population of 3656 engaged in cattle feeding, and the manufacture of coarse woollens, carpets, and bricks. *Lacaune*, 16 miles from Castres, has iron mines, manufactures of coarse broad cloths, and 3965 inhabitants. *Lautrec*, 8 miles N.W. from Castres, formerly defended by a castle, of which scarcely a vestige remains, has 3467 inhabitants, who trade in woollen stuffs, cattle, and poultry. *Mazamet*, on the left bank of the Arnette, and near its confluence with the Thoré, is a considerable town with important manufactures of broad cloth, flannel, swan skin, &c.; it has also dye-houses, paper and fulling mills, and 9662 inhabitants. Several large fairs are held in this town for the sale of wool, manufactured goods, cattle, chestnuts, and other agricultural produce. *Montredon*, situated 16 miles N.N.E from Castres at the foot of a hill, the summit of which is crowned with the ruins of an ancient castle, has 5213 inhabitants, who manufacture hosiery and trade in cattle, oats, &c. *Murat*, a village 36 miles E. from Castres, has a population of 2908, and some trade in cheese, poultry, and cattle. *Roquecourbe*, on the left bank of the Agout, has mineral springs, 2053

inhabitants, and manufactures of hosiery, woollen yarn, and woollen cloth. *Vabres*, on the left bank of the Gigou, 16 miles E.N.E. from Castres, has cotton mills, cloth factories, and 2529 inhabitants.

The arrondissement of Gaillac is named from *Gaillac*, a large ill-built town, with a tribunal of first instance, a college, and 8131 inhabitants, situated on the left bank of the Tarn, 12 miles from Alby. Gaillac consists of a town and several suburbs, some of which are more regularly built than the town itself; the territory about it produces strong dark-red wines well fitted for export. The industrial exports are brandy, leather, wine-casks, hats, articles of turnery; boats are built; the commerce in wine, brandy, corn, fruits, anise and coriander seeds, juniper berries, &c., is considerable. *Cadalen*, 6 miles from Gaillac, has a population of 2206. *Castelnau-de-Montmirail*, a considerable market-town, situated on a hill in the midst of a fine corn country, 6 miles N.W. from Gaillac, has marble quarries and 3086 inhabitants. *Cordes*, situated on a conical hill of rapid ascent 13 miles N. from Gaillac, has very steep streets, many interesting mediæval houses, and the remains of an ancient fort on the crown of the hill commanding a very extensive view. The population, in number 2779, manufacture chemical products, leather, and tiles. *L'Isle-D'Alby*, a pretty town on the right bank of the Tarn, 5 miles S.W. from Gaillac, has 4951 inhabitants chiefly employed in agriculture. *Rabastens*, also on the right bank of the Tarn, 11 miles S.W. from Gaillac, is an ill-built town with pretty suburbs and walks, the remains of a strong castle often taken in the wars of the 13th and 14th centuries, and 5825 inhabitants who trade in corn, wine, hemp, fruit, and sail cloth.

The arrondissement of Lavaur is named from *Lavaur*, a town of 7122 inhabitants, situated in a fertile country on the left bank of the Agout, which is here spanned by a very bold arch 160 feet wide and 90 high. The town is of considerable extent; it consists of an old and new town, both in general ill built, and has a tribunal of first instance, a public library of 4000 volumes, an agricultural society, a college, and 7122 inhabitants. Silk, serge, hosiery, leather, silken and cotton yarn, are the chief industrial products. Silkworms are reared in great numbers in this district. *Graulhet*, prettily situated on the Adou, 10 miles E.N.E. from Lavaur, has numerous tanyards, wool-scouring works, hat-factories, and 5197 inhabitants. *Puylaurens*, situated on a hill which commands a view of the fine plain of Revel, 14 miles S.E. from Lavaur, has silk mills, a considerable trade in horses and mules, and a population of 6095.

The department forms the see of the archbishop of Alby; it is included in the jurisdiction of the High Court of Toulouse, and belongs to the 10th Military Division, of which Toulouse is headquarters. Under the late monarchy it returned 5 members to the Chamber of Deputies; it now has 3 representatives in the Legislative Assembly of the Republic. With regard to public instruction, the department made part of the circuit of the university-academy of Toulouse until this year (1850), when the Legislative Assembly passed an act to establish a university-academy in the capital of each department in France.

(*Dictionnaire de la France; Annuaire pour l'An* 1850; *Annuaire du Commerce*, Paris, 1850.)

TARN-ET-GARONNE, a department of France, formed in 1808 out of portions of Quercy, Rouergue, Agenois, and Upper Languedoc, which were previously included in the neighbouring departments, is bounded N. by the department of Lot, E. by those of Aveyron and Tarn, S. by Haute-Garonne, and W. by Lot-et-Garonne and Gers. Its greatest length from N.E. to S.W. is about 60 miles, from N.W. to S.E. 44 miles; but the average width is only about 25 miles. The area is 1417 square miles, and the population in 1846 was 242,498, which gives 171.06 to the square mile, being 2.67 below the average per square mile for the whole of France.

The department consists of two inclined plains, which intersect in the water-line of the Garonne, and are furrowed by numerous streams forming deep and in many places narrow valleys. The general surface is pretty level. The subsiding swells of a projection of the Pyrenees traverse the country between the Garonne and its feeder the Gimone; the highlands which hitherto separated the Tarn and the Aveyron sink into the plain of Montauban; and the hills of Quercy, which cross the north-east of the department in several low chains, extend to the right bank of the Aveyron, the Tarn, and the Garonne, giving rise to a great number of streams that empty themselves into one or other of the rivers just named.

The department takes its name from its two principal rivers the GARONNE and the TARN, both of which, and the AVEYRON, are navigable. The chief affluents of the Garonne, besides the Tarn, in the department, are the Gimone and the Rats on the left bank, and the Barguelonne on the right. Highway accommodation is afforded by 7 national, 17 departmental, and a great number of parish roads.

The alluvial plains along the Garonne, the Tarn, and the Aveyron, and the lower parts of the valleys, are among the most productive lands in France, yielding a large quantity of the best wheat, besides maize, barley, hemp, tobacco, oleaginous seeds, pulse, potherbs, &c. The soil of the hill slopes and higher plains is generally composed of a whitish earth mixed with clay and fine sand, or in some parts with gravel; it is not productive of corn, but admirably adapted for vine-culture. The annual produce of wine in the whole department amounts to about 8,800,000 gallons, about 5,000,000 gallons of which are exported or distilled into brandy. The country between the Tarn and the Garonne produces superior red wines, which keep and bear transport well. The natural pastures and artificial meadows are comparatively of small extent and insufficient for the nourishment of the cattle kept. The deficiency is supplied during a great part of the year by green feeding; but in winter the fodder of cattle is wheat straw with some potatoes, beans,

and the pulp of oleaginous plants. The hay produced, and the oats, are reserved for feeding horses and mules. The department is famous for its large walnuts and chestnuts; other articles of culture are—black millet, buckwheat, melons, turnips, flax, and fruit of all kinds. The white mulberry is grown to a small extent. Game is abundant, including wild boars, badgers, hares, ortolans, partridges red and gray, and woodcocks. Of fish, salmon, sturgeon, shad, and lampreys, are the most common. Mules of great beauty are reared in great numbers; horned cattle and pigs are numerous; sheep few. Ducks, geese, turkeys, and other poultry, are plentiful. Bees and some silkworms are tended.

The climate is temperate but variable. The springs are in general rainy; the summer, at first mild, becomes very hot towards the end of July; autumn, as in all the south of France, is almost invariably fine; winter is dry and cold; snow is rare.

The agricultural population of the department is not grouped in villages and hamlets, but dispersed over the country, farmers in almost every instance residing upon their own holdings; these are mostly enclosed by quickset hedges, which, with the numerous clumps of quince-trees, the chestnut grounds, and other plantations, give the country a pretty appearance.

The minerals include only iron, coal, marble, building and lime stone, marl, and potter's clay. The manufactures are confined to the towns; the products comprise woollen cloth, canvass, serge, silk stockings, cutlery, soap, and woollen yarn. There are also cotton-mills, dye-houses, potteries, paper-mills, tan-yards, 3 beet-root sugar-factories, 605 wind and water mills, and 2 blast furnaces and iron foundries. The chief exports are corn, wine, and brandy. Flour ground in the Montauban mills is largely exported. Other articles of trade are plums, oil, saffron, wool, paper, hides, &c. Above 400 fairs are held in the year. The exports are shipped from Bordeaux.

The surface measures 906,350 acres, distributed among 53,824 proprietors, and into 857,128 parcels. Of this area 566,445 acres are under the plough; 42,864 under pasture and meadow; 90,698 under vines; 119,754 acres are covered with woods and forests; 40,924 consist of barren wastes; 12,533 acres are occupied with gardens, orchards, nurseries, and miscellaneous culture; 9459 with rivers, canals, and ponds; 13,590 with roads, streets, and squares; and 4544 with buildings, churches, and cemeteries.

The department is divided into 3 arrondissements, which, with their subdivisions and population, are as follows:—

Arronds.	Cantons.	Communes.	Pop. in 1836.
Montauban .	10	62	107,985
Moissac . .	6	49	62,103
Castel-Sarazin	7.	81	72,410
Total . .	23	192	242,498

Of the arrondissement of Montauban and of the whole department the capital is MONTAUBAN. *Caussade* is a pretty town, surrounded by well-built suburbs and situated in a fertile country, on the left bank of the Lère, 12 miles N.E. from Montauban. The population is 4292. The chief industrial products are linen, woollen cloth, beet-root sugar, and leather; there is also some trade in corn, flour, saffron, juniper berries, truffles, poultry, cattle, hemp, wool, and dried plums. *Caylus*, agreeably situated on the Bonnette, 24 miles N.E. from Montauban, and remarkable for the remains of its ancient castle, has a population of 5152. *La-Française*, 8 miles N.W. from Montauban, near the right bank of the Tarn, has potteries, and 3888 inhabitants. *Molières*, 14 miles N. by E. from Montauban, with a population of 2599; *Monclar*, 12 miles E.S.E. from Montauban, population, 2210; and *Montpezat*, 20 miles N.N.E. from Montauban, with 2900 inhabitants; are small places that give names to cantons. *Négrepelisse*, 10 miles N.E. from Montauban, on the left bank of the Aveyron, has 3122 inhabitants, who manufacture fustian, and trade in flour, corn, wine, and hemp. *Realville*, 9 miles N.E. from Montauban, near Caussade, has a population of 3029. *St.-Antonin*, an ill-built town at the junction of the Bonnette with the Aveyron, 24 miles N.E. from Montauban, has important manufactures of paper, leather, woollen stuffs, and serge; population, 5410.

The arrondissement of Moissac is named from its chief town *Moissac*, which is situated in a pretty country on the Tarn, 15 miles N.W. from Montauban, and has tribunals of first instance and of commerce, a college, and 10,762 inhabitants. The town is well built, and has a good trade in flour, oil, wine, and wool. A shady walk formed by fine trees has replaced the ditches that formerly surrounded the town; there is also a handsome promenade along the right bank of the Tarn. The bridge over the Tarn, the ancient fountain, the church of St.-Pierre, and the high hill surmounted by a cross, to the north of the town, are the most remarkable objects in this place. The church just mentioned, and the adjoining cloisters, formed part of the ancient abbey of Moissac, and date from about the year 1100; the church portal dates from the 12th century, and is remarkable for its bold and richly-executed ornaments in sculpture and bas-reliefs. Moissac is ancient; the abbey was founded in the seventh century by St. Amand, bishop of Maastricht; the town was taken after a siege by Simon de Montfort in 1212; in the 14th century it was taken and held for many years by the English. *Auvillars*, situated on a hill above the left bank of the Garonne, 12 miles from Moissac, has 2178 inhabitants. *Lauzerte*, situated in a fertile country on a hill near the Barguelonne, 12 miles N. from Moissac, has 3444 inhabitants, who trade in corn, wine, fruits, and cattle. *Montaigu*, 18 miles N. from Moissac, on the right bank of the Seune, has manufactures of woollen cloth and leather, and a population of 4073. *Valence*, 10 miles W. from Moissac, on the right bank of the Garonne, and at the junction of the roads from Toulouse and Montauban to Agen, has 3088 inhabitants, who

trade in leather, clarified quills, feathers, corn, tiles, bricks, and agricultural produce.

The arrondissement of Castel-Sarazin is named from *Castel-Sarazin*, a clean well-built town 11 miles W. from Montauban, formerly surrounded by walls and ditches, which are now replaced by handsome public walks. The town, which stands in a wide fertile plain on the Azin, and near the right bank of the Garonne, has a tribunal of first instance, a college, and 7008 inhabitants. Some remains of the old ramparts, two gate-entrances resembling those of Toulouse, and the gothic portal of the principal church, are the chief objects of notice. The industrial products comprise serge, hosiery, hats, linen, &c.; there is also some trade in corn, oil, saffron, and other agricultural products. *Beaumont-de-Lomagne*, a neat well-built town of 4112 inhabitants, is situated on a gentle slope, in a rich and pretty country on the left bank of the Gimone, 12 miles S. by W. from Castel-Sarazin. It is built on a regular plan, the streets running in straight lines from a central square, in the middle of which stands a spacious covered market-place. Beaumont is a very cheap and agreeable place to live in; it is the principal market-town in the valley of the Gimone, which is very productive in corn and wine, and presents much delightful scenery. Coarse woollens, tiles, and leather, are the principal industrial products. *Grisolle*, situated on an old Roman road 17 miles S. by E. from Castel-Sarazin, has 2017 inhabitants and a church dating from the 14th century, the portal of which is decorated with some very curious sculptures. *Montech*, built on a hill 9 miles S.E. from Castel-Sarazin, has 2758 inhabitants. *St-Nicolas de-la-Grave*, a small town of 2033 inhabitants, 6 miles W. from Castel-Sarazin, stands in a fertile district famous for its melons. *Verdun-sur-Garonne*, 16 miles S.S.E. from Castel-Sarazin on the left bank of the Garonne, stands in a pretty country, but seems going to decay. The population amounts to 4213.

The department forms the see of the bishop of Montauban; it is comprised in the jurisdiction of the High Court of Toulouse; and belongs to the 10th Military Division, of which Toulouse is headquarters. With respect to public education the department made part of the circuit of the University-Academy of Toulouse till the passing of the measure on education in 1850, which establishes a university-academy in each department. Under the late monarchy the department returned 4 members to the Chamber of Deputies; it now has 5 representatives in the Legislative Assembly of the Republic.

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TARNOPOL. [GALIZIA.]

TARNOW, or TARNOF. [GALIZIA.]

TARPORLEY. [CHESHIRE.]

TARQUI'NII, an ancient town of Etruria, on the southern bank of the river Marta, which empties itself into the sea a few miles below. The origin of this ancient city is unknown; but it was in remote times a powerful city, as appears from the wars which it carried on with Rome, and from the remains which have recently been discovered. Probably it formed one of the twelve republics of Etruria. After the expulsion of Tarquinius Superbus from Rome, in B.C. 509, the Tarquinienses were the most forward in his cause. (Livius,' ii. 6, &c.) About B.C. 397 the Tarquinienses again made war upon the Romans, but they were defeated by A. Postumius and L. Julius. Hostilities were carried on at intervals until B.C. 356, when the Tarquinienses were again defeated, and Tarquinii was glad to make a truce. It finally became a Roman Municipium.

The site of the ancient Tarquinii is clearly discernible in the ruins still extant on the hill of Tarchino, near the modern town of Corneto. Numerous works of art have been discovered in the tombs and catacombs. The first of these were opened in 1699, and what was found in them was described by Buonarotti. New discoveries have frequently been made there since that time; the most important are the paintings with which the walls of the catacombs are decorated; but besides these, thermæ and temples with inscriptions, mosaics, and vases, and other works of art, are found there.

TARQU'INIUS. According to early Roman history the family of the Tarquinii gave two kings and one consul to Rome. Its origin was traced to the town of Tarquinii in Etruria, and thence to Greece. Modern investigations however have shown that the Tarquinii did not come from Etruria, but must originally have belonged to Latium, and that from the earliest times there existed at Rome a gens Tarquinia. (Niebuhr, 'Hist. of Rome,' i., p. 373, &c.)

Lucius Tarquinius Priscus. The old story concerning his birth and his arrival in Rome is this:—During the tyranny of Cypselus at Corinth, Demarátus, who belonged to the noble family of the Bacchiads, was obliged by the tyrant to quit his native city. He sailed to Etruria, and took up his residence at Tarquinii. Here he married a woman of noble rank, who bore him two sons, Lúcumo and Aruns. (Dionys., iii. 46; Liv., i. 34; Polyb., vi. 2.) As an aspiring foreigner could not hope to satisfy his ambition in Etruria, Lucumo, after the death of his father and brother, emigrated with his wife Tanaquil and a numerous band of friends to Rome, where he was favourably received by King Ancus Marcius, and lands were assigned to him. He took the name of Lucius Tarquinius, to which subsequently the name Priscus was added to distinguish him from other members of his house. His wealth and prudence induced King Ancus to allow Tarquinius to take part in all the affairs of state, and in his will he made him the guardian of his children, who were yet under age. On the death of Ancus, he succeeded in persuading the people to elect him king, to the exclusion of the sons of Ancus, 616 B.C.

Tarquinius Priscus defeated the Sabines, from whom he took the town of Collatia with its territory. He also defeated the Latins, with whom he made peace. Several constitutional changes are attributed to him. He built the Circus Maximus, and is said to have established the Ludi Magni, or Romani. The great works of Rome, called the cloácæ or sewers, were begun under the reign of

this king. Tarquinius was killed after a reign of thirty-eight years (B.C. 578) by some assassins, instigated by the sons of Ancus Marcius. He left two sons, Lucius and Aruns Tarquinius; but his successor was Servius Tullius.

Lucius Tarquinius Superbus, the seventh and last king of Rome, was the son of Tarquinius Priscus, and brother of Aruns. Tullia, a daughter of Servius Tullius, was married to the gentle Aruns, and her sister to L. Tarquinius. In concert with Lucius, Tullia murdered her own husband Aruns and her sister, and married L. Tarquinius. Lucius placed himself at the head of a conspiracy, and murdered his own father-in-law, the aged Servius Tullius. Tarquinius, who received the surname of the Haughty or the Tyrant (Superbus), succeeded his father-in-law as king of Rome, 534 B.C., without either being elected by the people or confirmed by the senate.

The first act attributed to him after his accession is the death of all the senators who had supported the reforms of Servius Tullius. He in fact undid all that Servius had done; he took on himself the administration of justice, put persons to death or sent them into exile according to his own pleasure, and kept the whole internal and external administration in his own hands, without either consulting the people or the senate.

He never filled up the vacancies which so frequently occurred in the senate through his executions, banishments, or through the natural death of senators. Tarquinius, by cunning and fraud, or, according to others, by force of arms, subdued the towns of Latium, and placed Rome at the head of the league, which was now also joined by the Hernicans and the Volscian towns of Ecetra and Antium. The wealthy town of Suessa Pometia was besieged and taken. The Latin town of Gabii experienced a similar fate. Tarquinius founded in the conquered territory of the Volsci the colonies of Signia and Circeii.

Tarquinius built the capitol, with the threefold temple of Jupiter, Juno, and Minerva, and adorned it with brazen statues of the gods and of the early kings. Here he also deposited the oracular books which he had purchased from a Sibyl. The coffers of Tarquinius being now exhausted by the great works that he had undertaken, he was tempted to make himself master of Ardea, a wealthy town of the Rutuli. As however he did not succeed in his first attack, he laid siege to the town. During this siege, Lucretia, the wife of L. Tarquinius Collatinus, was violated by Sextus, the king's eldest son; Lucretia killed herself, and L. Junius Brutus, a nephew of the king, raised the Romans to revolt against the tyrant, who was expelled from Rome B.C. 510.

Tarquinius however did not give up the hope of recovering what he had lost. He first sent ambassadors to Rome to demand his moveable property. During their stay in the city the ambassadors formed a conspiracy, in which young patricians chiefly joined them. The conspirators were discovered and put to death, and the moveable property of the royal family was given up to the people. The king, aided by the inhabitants of Cære and Tarquinii, and the Veientines, led forces against the Romans, who however defeated their enemies near the forest of Arsia. Brutus fell in this battle in single combat with Aruns, the son of Tarquinius. Tarquinius now found assistance at Clusium, which was then governed by Lar Porsenna. During the war of this chieftain with Rome, Tarquinius is entirely lost sight of in the narrative of the historians; but after its conclusion we find him supported by the Latins, and waging a fresh war against Rome under the Latin dictator Octavius Mamilius of Tusculum. The battle near lake Regillus (496 B.C.), in which the king lost his only surviving son, decided the contest. The aged king retired to Cumæ, which was then governed by the tyrant Aristodémus, where he died the year following, 495 B.C.

Lucius Tarquinius Collatinus, the son of Egerius, and the husband of Lucretia. After the banishment of the king he was elected consul together with L. Junius Brutus. But the people, beginning to suspect that he might perhaps be tempted to follow the example of his kinsman, and endanger the freedom of the young republic, he was compelled to abdicate, and to submit to the sentence of exile, which was now pronounced upon the whole family of the Tarquinii. (Livy, i. 57, 60; ii. 2.)

TARRAGON. [ARTEMISIA.]

TARRAGONA. [CATALUÑA.]

TARRUNTE'NUS PATERNUS, a Roman jurist, was Præfectus Prætorio under Commodus, by whom he was put to death. (Lamprid., 'Commod.,' 4.) He wrote four books De Re Militari, from which there are two excerpts in the Digest. He is mentioned by Vegetius ('De Re Militari,' i. 8).

TARSHISH is a place mentioned in the Old Testament, particularly in connection with the commerce of the Hebrews and Phœnicians. In several passages of the Bible 'ships of Tarshish' are spoken of, especially in connection with Tyre; and it is pretty generally agreed that that phrase only describes a species of large ship, such as those used in the trade with Tarshish, just as we speak of 'Indiamen.'

It has been generally identified with the Phœnician emporium of Tartessus in Spain, a place which would undoubtedly furnish the products said to have been brought from Tarshish; but there is a considerable difficulty about the position of this Tartessus. The ancient geographers place it, some at the mouth of the river Baetis (Guadalquivir), the most ancient name of which river they state to have been also Tartessus; while others identify it with the city of Calpe, or Carteia, near Mount Calpe, the rock of Gibraltar. The best way to explain and reconcile these statements seems to be by taking the latter as the name of the whole country in the neighbourhood of Gibraltar. In confirmation of this view, Strabo states that the country in the neighbourhood of Calpe was called Tartessis.

TA'RSIUS, Storr's name for a genus of *Lemuridæ* peculiar to Java, Sumatra, &c. Example, *Tarsius Bancanus*, Horsfield. Dr. Horsfield obtained this animal in Banca, near Jeboos, one of the mining districts, where, he says, it inhabits the extensive forests in the vicinity.

M. F. Cuvier remarks that the dentition of the *Tarsius* approximates the animal more to the *Galeopitheci*, and even to the bats, than to the *Quadrumana*. The bones of this genus are well represented in the excellent *Ostéographie* of M. de Blainville.

TARSUS, now TERSOOS, a town on the Cydnus, situated in Itshili, a division of Caraman, and formerly one of the chief towns of Cilicia. It is about twelve miles from the sea, in 37° N. lat. and 34° 50′ E. long. The traditions about its origin are various. The first historical notice of Tarsus is in Xenophon, 'Anab.,' i. 2, who describes Tarsus as a great and flourishing city when it was taken and plundered by the younger Cyrus, who afterwards concluded a treaty with Syennesis, king of Cilicia, who had his palace there. Tarsus flourished under the Roman emperors, under whom it had various successive names. It was also noted for its schools of philosophy. St. Paul was a native of this town.

Very few remains of the ancient city of Tarsus exist: at the north-west end of the ancient town is part of an old gateway, and near it a very large mound, apparently artificial, with a flat top, from which is an extensive view of the adjacent plain: on an eminence to the south-west are the ruins of a spacious circular edifice, probably the gymnasium. Lucas, who visited it in 1704, only noticed one inscription, which he gives (i. 271-2, Amster., 1714). For the probable situation of the tomb of Julian, see Rennel, 'Western Asia,' 88, &c. On a rock three or four leagues from Tarsus is a fortress, called the Castle of Giants. Kazalu, the port of Tarsus, is now about twelve miles distant, and is closed up by a sand-bar. (Beaufort's 'Survey of Caramania,' 276.) The population of Tarsus is about 6000, chiefly Greeks and Armenian Christians, governed by a Moosellim: its site is unhealthy.

TARTA'GLIA, NICHOLAS, a learned Italian mathematician, was born at Brescia about the beginning of the 16th century, and when he was six years of age his father, who followed the humble occupation of a messenger, or carrier, died, leaving him in indigent circumstances.

No account has been transmitted of the means by which Tartaglia obtained a knowledge of the rudiments of science. It is probable that he owed but little to a preceptor, and his own exertions chiefly enabled him to attain at length the highest rank among the geometers of his time. Having passed several years as a teacher at Verona and Vicenza, he was appointed professor of mathematics at Brescia, and in 1534 he removed to Venice, where he held the like post till his death, which took place in 1557.

Tartaglia wrote on military engineering and on natural philosophy, but it is on his talents as an algebraist that his fame principally rests. In the year 1535 he found out the solutions of two equations, in which the first and third powers of the unknown quantity enter without the second, and four years afterwards he communicated the rule for the solution to Cardan under a solemn promise of secrecy. This promise was violated by Cardan who, in his work entitled 'Ars Magna' which he published in 1545, gave the rule for the solution of the cubic equation containing the first and third powers of the unknown quantity. He does not assert that he is the discoverer of the rule, but observes that it was first found out about 30 years previously by Scipio Ferreus, of Bologna; and adds that it had since that time been independently discovered by Tartaglia.

The principal works of Tartaglia are—'Nuova Scienza; cioe, Invenzione nuovamente trovata, utile per ciascuno Speculativo Matematico, Bombardiero,' &c., 1537: this is a treatise on the theory and practice of gunnery, and it was translated into English in 1588. 'Quesiti ed Invenzioni Diverse,' 1550: this work, which is dedicated to Henry VIII. of England, contains the answers to questions which had been proposed to Tartaglia concerning mechanics and hydrostatics; and to one of the books there is a supplement concerning the art of fortifying places. 'Trattato de' Numeri e Misure,' 1556-1560. 'Trattato di Aritmetica,' 1550.

TARTAR, EMETIC. [ANTIMONY.]

TARTARIC ACID was first obtained in a separate state by Scheele; it exists in several vegetable products, but principally in bi-tartrate of potash, which is usually called *Cream of Tartar*, a salt which is deposited from wine.

Tartaric acid is colourless, inodorous, and very sour; it occurs in crystals of a considerable size, the primary form of which is an oblique rhombic prism; it suffers no change by exposure to the air; water at 60° dissolves about one-fifth of its weight, and at 212° twice its weight. It combines readily with alkalies, earths, and metallic oxides; and these salts are called *Tartrates*. For an account of the more important of these we refer to the respective bases. Tartaric acid has a remarkable disposition to form double salts, one of the most distinct and remarkable of which is the tartrate of potash and soda, which has long been employed in medicine under the name of Rochelle Salts.

The anhydrous acid consists of $C^4 H^2 O^5$; and the crystals contain one equivalent of water to one of acid.

By the action of heat, so as partially to decompose it, tartaric acid is converted into tartrelic and tartralic acids, which are not of sufficient importance to require description.

Tartaric acid is largely employed as a discharge in calico-printing, and for making what are called sodaic powders, which are imitations of soda-water.

Medicinal Uses.—Tartaric acid is entirely confined to the vegetable kingdom, and is found free or uncombined in tamarinds, in the unripe grape, and in pepper; and in combination in tamarinds, ripe grapes, gooseberries, mulberries, squill, dandelion, chenopodium vulvaria, in various species of pines, and as tartrate of lime in the fruit of the *Ithus typhina*. For medical purposes it should be remarkably pure, when it is without odour, but makes a powerful acid impression on the organs of taste. In small doses, properly diluted, it acts as a refrigerant, and is of much value in fevers, particularly mucous, and in biliary remittents.

TARTARS, or, more correctly, TATARS

(Khazars and Kiptshak). The name Tatars once designated a great number of different nations in Middle Asia and Eastern Europe, which, according to general opinion, were of one common origin. It has gradually become a collective name, under which are comprehended different nations of Mongol, Turkish, and even Finnish origin.

The *Khazars*, the Ghysser or Ghazar of Moses of Khorene, inhabited in the time of this Armenian author, in the fifth century A.D., the country north of the Caspian Sea; and in the sixth century they penetrated into the countries north of the Khuban and the Black Sea, where they founded a powerful empire, which lasted in Europe until it was broken by the Russians in 1016; but in Asia it continued for two centuries longer, until it gradually sank under the repeated attacks of the Pechenegues, the Uzes, the Bulgars, the Kumanes, and the Yasses, and their very name had disappeared, when, in the beginning of the 13th century, eastern Europe was overwhelmed by the greatest of all conquerors, Gengis Khan. Gengis Khan gave to these warlike nations, the general name of which seems to have been Bede, the name of Köke-Mongols, that is, the Blue-Bold, or the Celestial Mongols. [GENGIS KHAN.] The word Tatar signifies in the Mongol language 'a tributary people,' a fact that rendered the change of name agreeable to his subjects.

With the empire of Gengis Khan the name of Mongols disappeared in Europe, and was no longer heard of except in the remote deserts of eastern Asia. The old name of Tatars however lasted as a designation of the Kiptshak.

Tatars of the Golden Horde, or of Kiptshak.—While Gengis Khan was carrying his arms into India and China, Batu, his grandson, invaded the west as far as the frontiers of Germany, conquered the easternmost part of Europe, which was inhabited by Slavonic, Turkish, and Finnish nations, compelled the princes of Russia to become his vassals; and in 1227 was made khan or viceroy of these territories by his grandfather. He chose for his vast dominions the name of Kiptshak. A second name of Batu's kingdom was that of the Golden Horde. Batu founded the town of Great Seraï, his capital; Seraï, called afterwards Baghji-Seraï, in the Crimea; and New Kasan, at a short distance from Old Kasan. He died in 1255. His successors were almost constantly engaged in wars with Russia, to which power they were at length obliged to submit. The Khanat of the Astrakhan was conquered in 1544. The Khanat of the Crimea was at first subject to Turkey, but it was conquered by Prince Potemkin in the reign of Catherine the First. [ASTRAKHAN; CASAN; CRIMEA.]

Many noble families of Russia and many of the common people are descended from the Tatars. Numerous words in the Russian language, several legal customs, various social usages and articles of dress, several names of weights, measures and coins, ceremonies at the emperor's court, the knout itself, are of Tatar origin. The influence of the Tatars upon the Russians has never been better characterised than by that bon-mot of Napoleon: 'Scrub a Russian and you will find a Tatar.'

TA'RTARUS (Τάρταρος) was, according to the notions of the Greeks and Romans, a part of the lower world, and was inaccessible to the light of the sun and to the winds. Homer describes it as being as far below Hades as heaven is above the earth, and as being provided with brazen gates at its entrance. ('Iliad,' viii, 13, &c., 481.) He further regards it chiefly as the place in which the gods were punished. In later times Tartarus designated that part of the lower world in which the shades of the wicked were punished.

TARTARY, or more correctly TATARY. This name was in former times given by Europeans to the country of Kaptshak or Kiptshak [TATARS], or the three Khanats of ASTRAKHAN, CASAN, and the CRIMEA, the last of which had the name of Little Tatary. Great Tatary, on the contrary, designated the vast country between the Caspian Sea on the W., the desert of Gobi on the E., Siberia on the N., and Persia, Afghanistan, and Tibet on the S. The greater part of it has now the more convenient name of TURKISTAN. The name of Tatary has entirely disappeared from geography, but it occurs frequently in history.

TARTASH TAGH, the Turkish name for that mountain-system which on our maps is named Bolor Tagh, or Beluth Tagh. At their southern extremity these mountains are connected with the Himalayas and Hindoo Coosh, and the point where the Tartash Tagh branches off from them is considered as the place where the ranges of the Himalaya and the Hindoo Coosh are separated from each other. This place occurs near 35° N. lat., and between 74° and 75° E. long., where a high mountain-mass rises to nearly 18,000 feet above the sea-level, and some thousands above the snow-line. From this point the mountain-mass extends in a north-by-west direction to 45° N. lat., and between 70° and 71° E. long. This mountain-mass is of great width, occupying between the parallels above mentioned all the countries which lie between 70° and 75° E. long. A great portion of these mountains appears to be elevated above the snow-line. In 41 N. lat. the Tartash Tagh crosses the mountain-range which is called Thian-shan, and which runs from west to east. In these parts the Bolor Tagh appears to be less elevated, so as to permit a passage over it, which connects Chinese Turkistan with Turan; but the mountains even here are always covered with snow.

TARTI'NI, GIUSEPPE, was born at Pisano, on the coast of Istria, in 1692, and educated at the university of Padua, for the profession of jurisprudence; but his love of music triumphed over his graver pursuit; and after some struggles, and several adventures of rather a romantic kind, —among which were the fighting of several duels, the marrying a cardinal's niece against her uncle's and his father's consent, and his consequent flight to a monastery, where he remained during two years secreted—he became a professed violinist, and the founder of a school which in after-times had Nardini, Pugnani, Viotti, and Baillot among its disciples.

Tartini was also a composer; but he is more generally known by his writings on the art, among which his 'Trattato di Musica seconda la

vera Scienza dell' Armonia' (1754) is the principal. He bases his theory of harmony chiefly on the production of what is called the *grave harmonic*, that is, a third sound which is heard when two harmonised sounds are produced. Tartini died at Padua in 1770.

TARTRATES. [TARTARIC ACID.]

TASMAN, ABEL JANSSEN, was one of the greatest navigators of the 17th century. In the service of the Dutch East India Company he was selected by Anthony Van Diemen, the governor-general, in 1642, to ascertain the extent of the Australian continent, on the western coast.

On Aug. 14, 1642, Tasman sailed from Batavia in command of two vessels, the Heemskirk and the Zeehaan. Having passed 127° E. long., he sailed to the north and east, and on Nov. 24 discovered a land, to which he gave the name of Van Diemen. He next sailed to the south-east, and doubled what he conceived to be the southern extremity of the Australian continent, or New Holland, but what in fact was the southern extremity of Van Diemen's Land. He made an unsuccessful attempt to anchor on the south-eastern coast, and then ran to the north, where he found secure anchorage in a bay, to which he gave the name of Frederik Hendrik Bay, 42° 52′ S. lat., 147° 57′ E. long. On the shore he erected a standard, to which he attached the colours of the Dutch East India Company, and on the 5th set sail again. On the 13th, being in about 42° 10′ S. lat. and 170° E. long., he discovered a high and mountainous country, which he named Staaten Land, now known as New Zealand. Tasman supposed this land to be part of the continent of Australia. He sailed along the coast towards the north-east, and on the 17th anchored at the entrance of what he named Mordenaars' Bay, or Murderers' Bay, from the circumstance of three of his sailors being killed by the natives. This was in 40° 40′ S. lat., 173° E. long. After he left this bay he was obliged to anchor again in a bay to the east of Murderers' Bay, which yet preserves his name. He next continued his course along the coast, bearing northwards, until, on Jan. 4, 1643, he perceived a group of small islands which he named the Three Kings (in about 34° 3′ S. lat., 172° 5′ E. long.). Those islands were inhabited, but the violence of the waves prevented all intercourse with the natives. On Jan. 6 he saw an island to the south at three miles distance, but no name is given to it. On the 8th, being in 32° S. lat. and 174° E. long., he changed his course to the north, and on the 19th discovered an island which he called Pyllstaart (25° 22′ S. lat., 176° W. long.). On the following day he saw two other islands, and on the 21st approached the more northern, which he named Amsterdam (Tongataboo), (21° 30′ S. lat., 175° 20′ W. long.); the other Middelburg (21° 24′ S. lat., 175° W. long.). While here he discovered some other isles, before one of which he anchored, naming it Rotterdam (20° 15′ S. lat., 174° 31′ W. long.).

On Feb. 1, Tasman discovered the islands of Prince William, but his provisions being nearly exhausted, he could not stay to visit them. On March 22 he was in 5° 2′ S. lat., and came in sight of a cluster of islands which had been visited by Schouten and Le Maire, and by them named Ontong Java. On the 29th he sailed past the Green Islands (4° 53′ S. lat., 154° 50′ E. long.), and on the 30th the Isle of St. John (3° 50′ S. lat., 153° 50′ E. long.). On April 1 he was in sight of what he supposed to be New Guinea, but in fact of New Britain, and shortly after he doubled the cape to which Spanish navigators had given the name of Cabo Santa Maria—Cape St. George of Dampier (5° S. lat., 152° 15′ E. long.). On the 20th he was near to Brandande Yland, or Burning Island: on the 27th in sight of another island, which he calls Jama, a little to the east of Moa (8° 21′ S. lat., 127° 45′ E. long.). On May 12 he coasted the island to which Schouten had given his name (50′ S. lat. 136° 20′ E. long.), and which is described as fertile and populous. Having now fulfilled his instructions, Tasman directed his course back to Batavia, where he arrived on June 15, 1643. A map of his discoveries was sent to the Stadt House at Amsterdam.

The success of this voyage induced Van Diemen to commit to Tasman the command of a second expedition. But of the results of this second voyage no account was ever published. Of the private life of Tasman nothing is known, nor when nor where he was born or died.

TASMANIA. [VAN DIEMEN'S LAND.]

TASSIE, JAMES, was born of humble parents, about the year 1735, in the neighbourhood of Glasgow, and was brought up as a stonemason. Feeling a strong desire to become a painter, he removed to Glasgow, and studied drawing, but continued to practise his business. In 1763 he went to Dublin, where he was employed for some time as a sculptor and modeller. There he was employed by Dr. Quin, who was making experiments in the art of imitating engraved gems by means of coloured glass, or pastes, and who engaged him as his assistant. He accompanied Dr. Quin to London in 1766; where he gradually obtained a competence, and established such a reputation, that the principal cabinets of Europe were thrown open to him. In 1775 Tassie published a catalogue of the gems in his collection, of which he sold pastes or sulphur impressions at very moderate prices. The collection then amounted to more than three thousand articles; but it was subsequently much extended, and in 1791 appeared a new catalogue compiled by Mr. Raspe, containing fifteen thousand eight hundred articles. About 1787 or 1788 Tassie received an order from the Empress of Russia for a complete set of his gems. He died in 1799. Tassie likewise displayed considerable talent in modelling small portraits in wax.

TASSO, BERNARDO, born at Bergamo in 1493, lost his father when a boy, and was brought up under the care of his uncle Luigi Tasso, bishop of Recanati. Tasso lived for several years at Padua and Venice, and other towns of North Italy, where he displayed his talent for poetical composition. In 1525 he engaged himself as secretary to Guido Rangone, who was general of the Papal troops in North Italy. A volume of Italian verses, which he published at Venice in

1531, made him known to Ferrante Sanseverino, prince of Salerno, who invited him to come to Naples, and granted him a handsome allowance. Tasso accompanied the prince in the expedition which Charles V. undertook against Tunis in 1534. He was afterwards sent to Spain, in 1537, on a political mission. Soon after his return to Naples, he married a young lady of Sorrento called Porzia de Rossi, by whom he had a son, Torquato Tasso. In 1547 an insurrection broke out at Naples against the Spanish viceroy Don Pedro de Toledo, and the Prince of Salerno having accepted a mission from the people to proceed to Germany and lay their grievances before Charles V., he was declared a rebel, and his property was confiscated. Bernardo Tasso followed his patron to France, where he was in great pecuniary distress. He then returned to Italy, and went to the court of Guidobaldo, duke of Urbino, whence he passed to that of Duke Gonzaga of Mantua, who made him governor of Ostiglia, in which place he died in 1569.

Bernardo Tasso's principal work is a romantic poem in ottava rima, entitled 'Amadigi,' the subject of which is taken from the Spanish romance of Amadis de Gaula, from which, after it was completed, he detached one of the episodes, and formed it into a separate poem, entitled 'Floridante.' He also wrote many lyrics. His son Torquato Tasso published 'Floridante,' after his father's death, and speaks in terms of high praise of Bernardo Tasso's poetical merits.

TASSO, TORQUATO, son of Bernardo Tasso, was born at Sorrento, in 1544. At the age of ten he was sent for by his father, then an exile, and after some time spent with him in north Italy, he went to the university of Padua to study law, for which however he had little inclination. At the age of eighteen he composed his first poem, 'Rinaldo,' in twelve cantos, which was published and dedicated to the Cardinal Luigi d'Este, in 1566, who took him into his service, and introduced him to his brother the Duke of Ferrara, and to the Duke's two unmarried sisters, Lucrezia and Eleonora. Tasso had been for some time in love with Laura Peperara, a lady of Mantua, to whom he addressed sonnets and other verses after the manner of Petrarch, styling her his Laura. But afterwards he appears to have been struck with the attractions of the Princess Eleonora, the Duke's sister. Most of the sonnets and other lyrics, which are evidently intended for this object of his second love, are conceived in a respectful and somewhat melancholy strain, as if the writer felt the hopelessness of his passion. But there are four of Tasso's compositions, written between 1567 and 1570, in which he assumes the tone of a favoured lover. These compositions however were not discovered by the Duke till many years afterwards. In 1571 Tasso accompanied the Cardinal d'Este on a mission to France, but left him at the end of the year. Having then returned to Ferrara, he entered the service of Duke Alfonso himself, by whom he was most graciously treated. Whilst Tasso was thus in favour he wrote his pastoral drama, the 'Aminta,' which was performed at court, and soon became famous through Italy. Lucrezia, Eleonora's sister, who had married

Francesco Maria, duke of Urbino, wishing to hear the 'Aminta,' invited Tasso to her court, where he remained several months.

Towards the end of 1573 Tasso returned to Ferrara to finish his great epic poem 'La Gerusalemme Liberata.' The touching episode of Olindo and Sofronia, in the second canto, was meant to portray his own situation with regard to the Princess Eleonora; and in a sonnet to her he evidently speaks of the character of Sofronia as meant to represent herself.

Parts of the 'Gerusalemme began to circulate about in MS., and the author was assailed by numerous pedantic critics. Towards the end of 1576 a false friend disclosed the secret of his love for the princess, for which Tasso struck him, and subsequently fought a duel, in which he was the victor, though his opponent had treacherously brought assistants. Nothing happened after this until June, 1577, when Tasso, in the apartments of the Duchess of Urbino, at Ferrara, fell into a passion at some impertinence of a domestic, and threw a knife at him. He was immediately arrested and confined. From the place of his imprisonment Tasso wrote a letter to the Duke, begging his pardon, and the Duke released him after a few days, and took him with him to his country seat of Bel Riguardo about the end of June. What happened there between the Duke and Tasso is not ascertained, but on July 11 the Duke sent Tasso back to Ferrara under an escort, and shut him up in the convent of St. Francis, with instructions to the monks to keep him confined as a madman.

Tasso now wrote many penitential letters, from which it would appear that he had assumed madness in order to satisfy the offended dignity of Duke Alfonso; but receiving no answer he ran away from the convent, quitted Ferrara, made his way to Naples, and thence to Sorrento, where his sister was married. Having by kind treatment recovered his health and his spirits, he went to Rome, and thence to Ferrara in the spring of 1578, with the Cavaliere Gualengo. He was coldly received by the Duke, and attempted in vain to get an interview with the Princess Eleonora and the Duchess of Urbino. Tasso again left Ferrara in the summer of 1578, wandered to Mantua, Padua, and Venice, and thence to Urbino, where he wrote to the Duke of Urbino, entreating him to contradict the reports 'circulated of his madness.' In Oct., 1578, he left Urbino, and went to Piedmont under an assumed name; but he became known, and received a flattering reception from Charles Emmanuel, prince of Piedmont. Tasso however had still his eyes and his heart fixed upon Ferrara, and encouraged by letters from the Cardinal Albano, he arrived at Ferrara Feb. 21, 1579, on the eve of the arrival of Margarita Gonzaga, the new bride of Duke Alfonso.

The Duke refused to see Tasso, the Princesses also denied themselves, and the court attendants treated him with rudeness and contempt. Tasso became furious; he uttered impertinent words against the Duke and the whole house of Este, which being reported to Alfonso, he gave orders to confine him in the hospital of St. Anna as a madman.

Tasso remained a prisoner in the hospital till July, 1586, and appears to have been treated very harshly at first by the attendants of the hospital. He wrote to the Duke and to the Princesses, but in vain. At last he grew more calm, and was treated with greater leniency. Tasso was visited in his confinement by various distinguished persons, and was in the meantime busy writing, or correcting his poetical compositions, which were printed at Venice, but very inaccurately, to his great annoyance. He wrote in his confinement several philosophical discourses or treatises, such as 'Il Gonzaga, ossia del Piacere Onesto,' 'Il Padre di Famiglia,' the discourse 'Della Virtù Eroica e della Carità,' the dialogue 'Della Nobiltà,' and others.

In 1583 Tasso grew seriously ill, and imagined also that he had a familiar spirit which appeared to him. In 1584 he was allowed to be at large during the Carnival season, and he wrote a dialogue entitled 'Il Gianluca o della Maschere.' He also wrote about that time the dialogues 'Il Beltramo, ovvero della Cortesia:' 'Il Malpiglio, ovvero della Corte;' 'Il Ghirlinsone, ovvero dell' Epitaffio;' 'La Cavalletta, ovvero della Poesia Toscana;' and 'Il Rangone, ovvero della Pace,' which last, addressed to Bianca Capello, grand-duchess of Tuscany, is dated from his apartments of St. Anna ('dalle sue stanze in St. Anna'). He was now tolerably composed, and could hardly be called a prisoner. But in that same year, 1585, a fresh source of vexations opened upon him. His poem, 'La Gerusalemme Liberata,' had been published complete at Parma in 1581, and afterwards at Mantua in 1584. A host of critics fell upon it, and strove to obscure all the merits of the poem. Tasso, weakened by mental and bodily suffering, felt these attacks bitterly. He however wrote in a measured and dignified tone a defence of his poem. He was at the same time writing letters to all his friends to obtain his final liberty from the Duke. At last Vincenzo Gonzaga, son of the Duke of Mantua, obtained, in July, 1586, permission for Tasso to accompany him to Mantua; and to make some return for the kindness which he experienced from the house of Gonzaga, he completed his tragedy of 'Torrismondo,' and dedicated it to his liberator Vincenzo, on his accession to the ducal throne in 1587. After some time spent at Mantua and at Bergamo, Tasso took leave of Duke Vincenzo, and repaired to Rome in the latter part of 1587, and thence to Naples in the following year. He there found a sincere friend in the Marquis Giovanni Battista Manso, who took him in the autumn to his estate of Bisaccio. It was at the request of Manso's mother that Tasso undertook his 'Sette Giornate del Mondo Creato,' a poetical paraphrase of the first two chapters of Genesis. In 1589 Tasso repaired to Rome; and then accepted an invitation of the Grand-Duke Ferdinand de' Medici to go to Florence in the spring of 1590, where he was received with great honour by the court and other persons of distinction.

Towards the end of the same year he returned to Rome, and in 1591 to Naples, and there began to re-write his epic poem, under the title of 'Gerusalemme Conquistata,' in order to satisfy the critics. However the first version of his poem is in the hands of all, whilst few ever read his 'Gerusalemme Conquistata.' In 1592 Cardinal Aldobrandini having been made pope by the name of Clement VIII., his nephew, Cinzio Aldobrandini, invited Tasso in the most pressing manner to Rome, where he came about the middle of that year. Here he completed his 'Gerusalemme Conquistata,' which he dedicated to Cardinal Cinzio Aldobrandini. In the summer of 1594 he returned to Naples. Meantime Cardinal Cinzio prevailed on Pope Clement to grant the poet the honour of being crowned with the laurel-crown in the Capitol, as Petrarch and others had been, and Cinzio hastened to announce the news to Tasso, who assented with some reluctance, and took leave of his friend Manso, with a foreboding that it would be the last. He arrived at Rome in the beginning of 1595, was lodged in the papal palace, and treated with the greatest regard. Cardinal Cinzio fell ill; the pageant was postponed; and then Tasso himself fell ill. He felt from the first a conviction that this illness would be his last; and he was, at his own wish, taken to the monastery of St. Onofrio, on Mount Janiculum, where he devoted his remaining days entirely to religious practices. He expired April 25, 1595, and was buried in the church of Sant' Onofrio, with a plain slab over his tomb, which bears the simple inscription, 'Torquati Tassi ossa hic jacent.'

The fame of Tasso as a great poet rests upon his 'Gerusalemme Liberata.' His lyrical compositions are numerous, and many of them exquisite both in language and sentiment. The whole of Tasso's poetical works have been published in one large 8vo. vol. of nearly 1000 pages, in double columns, at Venice, 1833. Prefixed to it is the biography of the author, by his friend the Marquis Manso.

Tasso's prose works consist of dialogues and dissertations; a treatise upon epic poetry; discourses upon the poetical art; and of numerous letters. Professor Rosini edited a new edition of all the works of Tasso, begun at Pisa in 1820.

Tasso's 'Gerusalemme Liberata' has been translated into most European languages. There are English translations by Fairfax, Hoole, Broadhead, Hunt, and Wiffen. It has also been paraphrased into several Italian dialects, Milanese, Neapolitan, Calabrian, &c.

TASSO'NI, ALLESSA'NDRO, born at Modena in 1565, was educated first in his native town, and afterwards at Bologna and Ferrara, where he studied the law. In 1597 he went to Rome, when he entered the service of Cardinal Ascanio Colonna, whom he accompanied to Spain in 1600. In 1603 the cardinal, having been made viceroy of Aragon, sent Tassoni to Rome to take charge of the administration of his property in Italy. At Rome he wrote his 'Considerazioni sopra il Petrarca,' published in 1609. In 1612 Tassoni published his 'Pensieri Diversi' in ten books, which, like his preceding work, led to a controversy with several of his contemporaries. Meantime the Cardinal Colonna having died, Tas-

soni applied to Charles Emmanuel I., duke of Savoy, who promised him the post of secretary to his son the Cardinal of Savoy, for which however he was kept waiting several years. In 1623 Tassoni left the Cardinal of Savoy, and retired to a country-house in the suburb of Transtevre, where he employed himself in study and rural occupation.

In 1626 Cardinal Ludovisi, nephew of Pope Gregory XV., took Tassoni into his service, and gave him a handsome stipend. After the cardinal's death, in 1632, Tassoni repaired to Modena, when he was made councillor to his sovereign Duke Francis I. of Este, for the remainder of his life. He died at Modena in 1635.

Besides those already mentioned, Tassoni wrote on several other subjects, but his fame rests on the celebrated mock-heroic poem, 'La Secchia Rapita,' or the 'Rape of a Bucket.'

TASTE. The organs of this special sense are certain parts within the cavity of the mouth, obviously so disposed as to take early cognisance of matters about to be swallowed, and to act as sentinels for the remainder of the alimentary canal, at the entrance of which they are situated. Their special endowment, aided by an exquisite development of common sensibility, enables them to give timely notice of any acrid, caustic, or nauseous quality, of any undue temperature, of any inconvenient hardness, irregularity, size, or sharpness in the material submitted to them, and thus to protect the stomach against the intrusion of many hurtful agents. These organs moreover establish for our appetites a scale of liking and disliking, and they superadd a discriminative pleasure to the enforced assuaging of hunger.

The membrane of the mouth and throat is the seat of this function, but it is not alike seated in all parts.

A small portion of the soft palate, just above the base of the uvula, the remotest part of the back of the tongue, where it corresponds to the isthmus of the palate, and the entire circumference of the tongue, are so endowed; while the internal surface of the cheeks, the hard palate, the gum, the remaining parts of the soft palate and of the tongue, are entirely destitute of it. Thus, those parts of the tongue with which, in sipping or in masticating, the food would have contact (its borders, and, most eminently, its tip), are gustative; and the property is shared, though in a less degree, by the lingual and palatine surfaces of the isthmus through which the food enters the sphere of involuntary actions.

The nerve specially endowed with the sense of taste is a branch of the third part of the fifth cerebral nerve, called, from its function, gustatory; but it seems possible to some physiologists that the glosso-pharyngeal nerve shares this property. The gustatory nerve is distributed to the papillary surface of the tongue, especially along its borders and tip: the lingual part of the glosso-pharyngeal nerve is restricted in its distribution to the posterior part of the tongue, where it supplies the mucous surface exclusively.

The sensation of taste admits of an immense variety of modifications which no language can express. Mr. Mayo has however given the following classification of the impressions produced by substances taken into the fauces:—

1. Where sensations of *touch* alone are produced, as by rock-crystal, sapphire, or ice.

2. Where, in addition to being felt upon the tongue, the substance excites *sensation in the nostrils*, as, for instance, tin and other odorous metals.

3. Where, besides being felt upon the tongue, it produces sensations of *taste*, as, for instance, sugar and salt.

4. Where the substance is felt on the tongue and tasted by it, and in addition excites a sense of flavour in the nostrils, as, for instance, bread, manna, and other substances.

Flavour, then (in distinction from *taste*), can in correctness be attributed only to bodies possessed of some aroma or volatility; and, by alternately smelling and tasting such, and by contrasting their impression with that produced by a simply sapid substance (mustard and salt can illustrate the two cases), it will be noticed that flavour is but an odour, which, from its affecting a comparatively unpractised part of the olfactory apparatus, is at first imperfectly and obscurely recognised.

TATARS. [TARTARS.]

TATE, NAHUM, was born in Dublin in 1652. His father was Dr. Faithful Tate, a clergyman in Ireland. He was educated at Trinity College, Dublin, whence he removed to London. On the death of Shadwell in 1690, the interest of Tate's friends procured him the situation of poet-laureate, which he held till his death. He is said to have been an improvident and intemperate man, and he died in the privileged precincts of the Mint, in Southwark, Aug. 12, 1715. Tate wrote a number of works, but is known now only by his metrical version of the Psalms, which he executed in conjunction with Dr. Nicholas Brady.

TATIA'NUS, of Assyria, was a pupil of Justin Martyr, after whose death he wrote an apology for Christianity, under the title of 'A Discourse to the Heathen.' In this work he gives some account of his own life. He was brought up in heathenism, but on coming to Rome, where he practised as a rhetorician, he met with Justin Martyr, by whom he was converted to Christianity.

After the death of Justin he embraced some heretical opinions, the germs of which may be seen in his 'Discourse to the Heathen.' The chief of his heresies were the Marcionite doctrines of the two principles of good and evil, and of the evil of matter, and the Valentinian doctrine concerning Æons. His followers were chiefly remarkable for their practical application of the Marcionite opinions by lives of the strictest asceticism. They lived in celibacy, refused all luxuries, and abstained from the use of wine even at the Lord's Supper.

Of his lost works the chief were a treatise on 'Perfection after the pattern of the Saviour,' and a 'Harmony of the Four Gospels.'

His 'Apology' is usually printed with the works of Justin Martyr. There are separate editions of it by Gesner, Zürich, 1546, fol.; and by Worth, Oxon., 1700, 8vo.

TATTA. [SINDE.]

TATTERSHALL. [LINCOLNSHIRE.]

TATTOOING is the name usually given to the custom common among many uncivilised tribes, of marking the skin by punctures or incisions, and introducing into them coloured fluids, so as to produce an indelible stain.

Herodotus, in describing the habits of the Thracians, says that to be tattooed or marked (στίζεσθαι) was an emblem of rank, and the want of it indicated meanness of descent (v. 6).

Isidore, in speaking of the Picts, whose name he derives from their coloured skins, tells us that the painting was done by squeezing out the juice of certain herbs upon the body, and puncturing the figures with a needle. ('Pictorial History of England,' vol. i., p. 129.) The practice was continued to some extent during the whole of the Anglo-Saxon period, and is among the English vices reprobated by William of Malmesbury after the Norman conquest.

In modern times the custom of tattooing has been found in most of the islands of the Pacific Ocean, and among many of the aboriginal tribes of Africa and America, as well as, on a limited scale, in the East. The native chiefs of New Zealand tattoo the face and the whole of the body in a variety of very elaborate symmetrical figures. It is done by puncturing the skin with sharp-pointed instruments till the blood flows, and then rubbing in charcoal. The age for tattooing the males varies from eight or ten years up to about twenty; the females have only the face slightly tattooed.

TAUBMANN, FRIEDRICH, was born at Wonsees, near Baireuth, on the 16th of May, 1565, where his father was a shoemaker. His father died very early; and his mother married a tailor, who wished to bring up his step-son Friedrich to his own business; but as the boy showed little inclination, he was sent, in 1577, to school at Culmbach, where he was obliged to gain his livelihood by singing and begging. In 1582 he went to the gymnasium of Heilbronn, where his Latin verses were admired. Ten years later he went to the university of Wittenberg, where he distinguished himself, and, in 1595, was appointed professor of poetry and eloquence, to which afterwards the honour of court-poet was added. He died at Wittenberg, on the 24th of March, 1613.

Taubmann was a wit and a scholar, and he did a great deal for sound learning, both by his lectures and his writings. Among his works are a 'Dissertatio de Linguâ Latinâ,' an edition of Virgil (1618), and an edition of Plautus (1621). After his death the name Taubmanniana was applied generally to witty sayings and anecdotes.

TAUCHERIA. [BARCA.]

TAUNTON, a market-town and parliamentary borough, in Somersetshire, is 163 miles W.S.W. from London by the Great Western and Bristol and Exeter Railway, 45 miles S.S.W. from Bristol, and 30 miles N.N.E. from Exeter. The town is situated in a fertile vale called Taunton Dean, and is about a mile long. The principal streets are wide, well paved, and lighted with gas; the houses are of brick, of respectable appearance. The Tone, a tributary of the Parrot, flows on the N.W. side of the town, and is crossed by a stone bridge of two arches. The Tone receives several tributaries within or very near the town. The Bristol and Bridgewater Canal passes by Taunton on the north side. The market-house stands in a spacious open area called the Parade, and is a brick building of considerable size; the upper part comprises the guildhall and an assembly-room, and the lower part consists of an arcade on each side, in one of which the corn-market is held. On the west side of the Parade there is a handsome building of the Ionic order, erected in 1821, the upper part of which is appropriated as a library, museum, and reading-room; and underneath, and in the rear, are the markets for fish, poultry, dairy produce, &c. The town contains also the Taunton and Somerset Hospital, and a union workhouse. The theatre is a small neat building. There are 3 churches. The church of St. Mary Magdalen is a spacious and very handsome edifice in the florid gothic style. St. James's Church is a plain edifice, with an ancient square tower. Trinity Church was consecrated in 1842. It is in the gothic style, built of white lias stone, with dressings of Bath stone. There are places of worship for several classes of dissenters. The free grammar-school was founded by Fox, bishop of Winchester, in 1522. The premises consist of a large and handsome school-room, and under the same roof is the dwelling-house of the master. The endowment is worth about 36*l.* a year. Taunton has returned members to Parliament since 1295 (23 Henry I.). The parliamentary borough returns 2 members, and had in 1841 a population of 12,306. The population of the town was 12,066.

TAU'RICA CHERSONE'SUS was the ancient name of the peninsula which juts out southwards from European Sarmatia, between the Pontus Euxinus (Black Sea) and the Palus Mæótis (Sea of Azof): it is now called the Crimea. Its physical features are described under CRIMEA.

TAURI'DA, a government of southern Russia, consisting of the Crimea and the Nogay Steppe, lies between 44° 30′ and 47° 50′ N. lat., 31° 25′ and 40° 25′ E. long., and is bounded N. by Kherson and Ekaterinoslav, E. by the sea of Asof, and S. and W. by the Black Sea. The total area of Taurida, exclusive of the Siwash, or Putrid Sea, E. of the isthmus of Perecop, is 23,460 square miles; the population in 1846 was 572,200, which included Tartars, Cossacks, Russians, Jews, Gipsies, Germans, and other foreign colonists. The Crimea and its towns have been already noticed under CRIMEA, BALACLAVA, BAKTSCHISSERAI, KAFFA, SEBASTOPOL, and SIMFEROPOL. The Nogay Steppe includes the whole of the extensive country from the Dnieper and its limans to the Berda. It is a dry elevated steppe on a basis of granite. The soil is in general dry, poor, sandy, and without wood; but there are here and there extensive hollows with rich black mould, which produce the finest grass. The climate is extremely mild, and differs little from that of the peninsula. The winter, though short, is severe. The only rivers are those which form the boundaries: the Dnieper

on the N.W., the Konskaïa on the N., and the Berda on the E. Salt-lakes are pretty numerous in this steppe. The coasts of the government are very irregular, and remarkable for projecting tongues or spits of land called *Kosas*. The Kosa Fendra, which now forms an island in the Black Sea, and the Kosa Arabatskaia, extending from the town of Arabat, a little N. of Kaffa, to the entrance of the Siwash, are very prominent instances of this formation.

TAURINE, a peculiar crystallisable substance contained in the bile. When heated in an open fire, this substance becomes brown, fuses into a thick liquid, swells up, exhales a sweetish empyreumatic odour resembling that of burning indigo, and leaves a charcoal, which is readily burnt: when submitted to dry distillation, it yields much thick brown oil, and a little yellow acidulous water, which holds an ammoniacal salt in solution.

TAUROME'NIUM, now TAORMI'NA, a town in the northern part of the east coast of Sicily. The ancient name, Tauromenium, like that of the river Tauromenius (the modern Alcantara), at the mouth of which the town was situated, was derived from Mount Taurus, on which the town was built. Tauromenium was founded by the inhabitants of the ancient town of Naxos, which lay a few miles south of Tauromenium. After the Roman conquest of Sicily, Tauromenium became a 'civitas fœderata,' and enjoyed prosperity under the protection of Rome.

Taormina at present has about 6000 inhabitants: its situation on a steep rock on the sea-coast is magnificent. It contains considerable ruins of ancient buildings, especially a theatre of gigantic dimensions, the seats of which are cut in the rock, which projects into the sea. This theatre and the aqueduct, or, as it is generally called, a naumáchia, of which there are remains, were not constructed till the time of the Empire. On the hills which rise above Taormina there are ruins of several castles, and among them one is very remarkable, which is called Mola, and was built in the ninth century of our æra by the Saracens, who took the town by storm after a long and brave resistance by the inhabitants.

TAURUS, MOUNT, according to the later Greek geographers, was a great chain of mountains which extended nearly due east and west from the shores of the Ægean to those of the supposed Eastern Ocean, and divided Asia into two parts, Asia within the Taurus and Asia without the Taurus. Their notions respecting this chain were by no means accurate, and indeed only a small part of it ever really bore the name.

The chain of Taurus, properly so called, commences at the south-western point of Asia Minor, and proceeding eastward parallel and near to the Mediterranean, it encloses between itself and the coast the narrow strip of land which formed Pamphylia and Cilicia. At the river Pýramus the chain divides into two, that of Amánus, which proceeds to the east, dividing Syria from Asia Minor, and the continuation of Taurus, which runs north-east, along the south-east side of Cappadocia, across the Euphrates into the northern part of Armenia, where it joins Mount Masius.

In Cappadocia the Taurus throws off a great branch called the Anti-Taurus, which passes through the middle of Cappadocia, north-east to the sources of the Halys, and thence east to the Euphrates. Its modern name is Alidagh. At Sebaste (Siwas) this chain joins that of the Paryadres (Chisheshi), which extends north-east as far as the mountains of Ararat. In modern geography the whole chain from the south-west of Asia Minor to Ararat bears the name of Taurus. The name itself is probably merely a form of a root which occurs in several languages, meaning mountain. [TAUROMENIUM.]

TAURUS (the Bull), the second constellation of the Zodiac. Its position in the heavens, surrounded by Aries, Eridanus, Orion, and Perseus, is easily obtained by the manner in which its bright star Aldebaran is connected with the belt of Orion. In all speculations upon the origin of the zodiac, Taurus must be an important object of consideration, since, at the earliest date which prudent speculation can consider it advisable to begin from, Aldebaran must have been at no great distance from the vernal equinox.

The figure is only a part of a bull, the head, shoulders, and fore legs. Aldebaran and the Hyades form the forehead and eye, and the Pleiades are in the shoulder. But Arátus must have drawn the figure differently, for he puts the Pleiades in the knees.

The Hyades form a group, of which five (some of the ancients said seven) are distinctly visible to the naked eye, α, θ, γ, δ, and ε of the constellation: there are many more in the cluster. These stars are arranged in the form of a V. The star α is Aldebaran. The name seems to be derived from ὗειν, to rain. The Latins call them *suculæ* (little pigs, no doubt meaning Aldebaran for the sow, and the others for her offspring), a name which Cicero and others state to have arisen from supposing the Greek word to have been from ὗς (pigs), and not from ὗειν. We think however it may be possible that they were right in their idea of the Greek word: the large star and the cluster of small ones might very easily suggest the notion of a sow and her litter.

The Pleiades are so close a group of stars that it is very difficult to say how many are seen by the naked eye. 'They are called seven,' says Hyginus, 'but no one can see more than six:' and six seems to be the number generally visible, though there are many more in the cluster. There is accordingly a supposition that some one star, once visible, has now changed its magnitude, or disappeared altogether. The name has been derived from πλεῖν, to sail.

TAURUS PONIATOWSKI, a constellation formed by the Abbé Poczobut, a Polish astronomer, in honour of the reigning king of Poland. Poczobut, in 1778, proposed this constellation to the French and other academies, by whom it was received. It is situated between Aquila and Ophiuchus.

TAVERNIER, JEAN BAPTISTE, Baron d'Aubonne, was the son of an Antwerp engraver who had settled at Paris and dealt in maps, and was born in 1605. He was a traveller from his

boyhood. Between 1620 and the close of 1630 he visited most of the countries of Europe. While yet a boy he visited England, Antwerp, Amsterdam, Frankfort-on-the-Main, Augsburg, and Nürnberg. He then entered the service of Colonel Brener, son of the governor of Vienna, and was present at the battle of Prague, Nov. 8, 1620. Some years later, he followed the Colonel to Vienna, and was presented by him to his uncle, the governor of Raab, at that time viceroy of Hungary, with whom Tavernier remained four years and a half in the capacity of a page. After making a short tour in Italy, and visiting his friends at Paris, he returned to Germany. During the summer of 1629 he made an excursion into Poland; on his return, hearing a report that the son of the Emperor Ferdinand II. was to be crowned king of the Romans in Regensburg, Tavernier proceeded to that city.

After such preliminary training, Tavernier commenced his travels in the East. He had already been turning his eyes in that direction, when the confidential agent of Richelieu, Father Joseph, proposed that he should accompany two French noblemen who were travelling to Palestine by way of Constantinople. Tavernier closed with the offer, and began his first journey to the East from Regensburg, in Dec., 1630; penetrated by way of Constantinople and Tabriz to Ispahan, and returned by Bagdad and Aleppo to Europe early in the summer of 1633. On Sept. 13, 1638, he obtained leave of absence from the Duc d'Orleans, to whom he had been appointed comptroller of the household. He embarked at Marseille in a Dutch vessel, and landing at Scanderoon, proceeded by way of Aleppo and the Great Desert west of the Euphrates to Basra; thence he went to Ormuz, and to Bushire, and proceeded through Shiraz to Ispahan. After some stay in that capital, he travelled by Shiraz and Lars to Gombroon, where he embarked for Surat. He visited Agra on this occasion; but here, as in many other instances, we are at a loss for dates to enable us to trace his routes. He was at Ispahan towards the close of 1642; and probably soon after returned to France. On his third voyage he took with him his brother, and left Paris Dec. 6, 1643. This time, after visiting Ispahan, he embarked at Gombroon for India. In January, 1645, he left Surat on an excursion to the diamond-mines near Golconda. In January, 1648, he made a voyage to Goa; and in April he embarked at Mingvela for Batavia; whence he returned to Europe in the Dutch fleet in 1649. Tavernier's fourth journey occupied him from June 18, 1651, when he set out from Paris, till 1655. On this occasion he proceeded from Persia to Masulipatan, in May, 1652; he revisited the diamond-mines near Golconda in 1653, and in 1654 he travelled from Ormuz to Kerman, and after spending three months there took the route of Yezd to Ispahan, and returned to Europe by Smyrna. His fifth journey was begun in Feb., 1656. He was at Agra in 1659, but we are at a loss for other dates in this journey. The sixth and last expedition that Tavernier made to the East was begun in Nov., 1663, and terminated in 1669. The most important novelty of this journey was his tour through the province of Bengal as far as Dacca. His first publication was an account of the interior of the seraglio at Constantinople ('Nouvelle Relation de l' Intérieur du Serrail'), published at Paris, in a thin 4to. volume, in 1675. This was followed by an account of his travels ('Six Voyages en Turquie, en Perse, et aux Indes'), also at Paris, in two 4to. volumes, in 1676. A third volume was added in 1679. Tavernier did not possess either the intellect or the education of Thévenot and Bernier, but his opportunities of observation were more varied and protracted. He had no knowledge of or taste for science and literature, for art, or antiquarian research. On Tavernier's return from his sixth journey he was presented with *lettres de noblesse*, by Louis XIV., and purchased the barony of Aubonne in the Pais de Vaud, but this he was obliged to sell, as well as his hotel at Paris, some time before 1688, through the misconduct of a nephew, to whom he had intrusted the management of his affairs in the Levant. He then retired first into Switzerland, and subsequently to Berlin, where he was nominated by the elector of Brandenburg director of a projected East India Company. His new appointment afforded him an opportunity for making another journey, and he set out to the East Indies across Russia in 1688. He was taken ill at Moscow, and died there in July, 1689.

TAVIRA. [ALGARVE.]

TAVISTOCK. [DEVONSHIRE.]

TAW. [DEVONSHIRE.]

TAX, TAXATION. *A Tax* is a portion of the produce of a country or its value, taken by the government for public purposes. *Taxation* is the general charging and levying of particular taxes upon the community.

In a free state it is assumed that all taxation is necessary for the public good; and it is justified by necessity alone. The amount of expenditure will, in a great measure, be determined by the magnitude of a state and by the number and importance of its political relations; yet the prudence with which its affairs are administered will affect the demands of the government upon the people nearly as much as its necessities. The expenses of a private person must be regulated by his income; but in a state, the expenditure that is needed is the measure of the public income that must be obtained to meet it. A civilised community requires not only protection from foreign enemies and internal security, but it needs various institutions which are conducive to its welfare, such as provision for the administration of justice, for instance. It is the business of a government to provide for these objects in the best manner and at the least expense consistent with their efficiency. Every tax should be viewed as the purchase-money paid for equivalent advantages. It is not uncommon to hear it argued that so long as taxes are spent in the country, the amount is not of consequence, as the money is returned though various channels to the people from whom it was derived. The principle we have just laid down exposes the fallacy of this doctrine, by reducing it to a simple question between debtor and creditor. For example,

suppose that by paying a million of money every year, the people obtain the services of an army. This we will suppose to be an equivalent, and we will further assume that the food and clothing of the force are purchased, and that the entire pay of the men is spent, within the country. The whole of the money will thus be returned: but how? Not as a free gift, not as the repayment of a loan, but in the purchase of articles equal in value to the whole sum. The only benefit obtained by this return of the million is clearly nothing more than the ordinary profits of trade; for the community has already provided the money, and then out of its own capital and industry it produces what is equal to it in value, and this it sells to the state receiving as payment the very sum which it had contributed as a tax.

No branch of legislation is more important than the wise application of just principles in the matter of taxation. The wealth, happiness, and morals of the people are to some extent dependent upon the financial policy of their government.

Adam Smith lays down four general maxims as to taxation, which are as follow:—

I. 'The subjects of every state ought to contribute towards the support of the government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state.'

II. 'The tax which each individual is bound to pay ought to be certain, and not arbitrary. The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor, and to every other person.'

III. 'Every tax ought to be levied at the time or in the manner most likely to be convenient for the contributor to pay it.'

IV. 'Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state.'

The net produce of a tax is all that the state is interested in; and therefore facility of collection is a great recommendation to any tax. A great disproportion between the cost of collecting and the amount ultimately secured is a good ground for removing a tax, though founded, in other respects, upon just principles. On this account alone, as well as for the general convenience of trade, it has been a wise policy to reduce, as far as possible, the number of articles upon which customs duties are levied. In England there is little variation from year to year in the gross charges of collection, but there is a considerable disproportion in the cost of collecting different branches of the revenue. In 1841 the excise cost 6*l.* 7*s.* 8*d.* per cent. in the collection; the assessed taxes 4*l.* 2*s.* 9*d.*; and the revenue arising from stamps only 2*l.* 3*s.* 4*d.* The French revenue is collected at a much greater cost than the English, and mainly owing to the very great number of persons employed in the collection.

The two great divisions under which most taxes may be classed are *direct* and *indirect*.

All taxes ought to be paid from the income of the community. To derive revenue from capital is to act the part of a spendthrift; and such a practice, as in private life, must be condemned. If the taxes of any country should become so disproportioned to its income, that in order to pay them continual demands must be made upon its capital, its resources would fail, employment of labour would decrease, and the revenue must necessarily be reduced by the general impoverishment of the taxpayers. Such a system could not long continue as regards all capital, but it may affect particular branches of capital, or all capital in certain conditions. In whatever degree it is permitted to operate it is injurious. A tax upon legacies is a direct deduction from capital; and on that account objectionable, although it is profitable to the treasury and very easily collected. The same observations apply to the probate duty, and to duties charged upon succession to the personal property of intestates.

With these exceptions it has been the object of the British legislature to derive all taxes from income, either by direct assessment or by means of the expenditure of the people upon taxed commodities.

Direct taxes upon the land have been universally resorted to by all nations. In countries without commerce, land is the only source from which a revenue can be derived. In most of the Eastern monarchies the greater part of the revenue has usually been raised by heavy taxes upon the soil; and in Spain, at the present time, the taxes upon the soil are most oppressive and injurious.

A tax on land in some form has existed in England ever since the Saxon times. During the troubles in the reign of Charles I. and the Commonwealth, the practice of laying weekly and monthly assessments of specific sums upon the several counties was resorted to, and was found so profitable, that after the Restoration the ancient mode of granting subsidies was renewed on two occasions only. In 1692 a new valuation of estates was made, and certain payments were apportioned to each county and hundred or other division. For upwards of a century the tax was payable under annual acts, and varied in amount, from one shilling in the pound to four shillings; at which latter sum it was made perpetual by the 38 Geo. III., c. 60; subject however to redemption by the landowners upon certain conditions. But no new valuation of the land has been made, and the proportion chargeable to each district has continued the same as it was in the time of King William III., as regulated by the act of 1692. That assessment is said not to have been accurate even at that time, and of course improved cultivation and the application of capital during the last 150 years have completely changed the relative value of different portions of the soil. On account of the generally increased productiveness of land, the tax bears upon the whole a trifling proportion to the rent, yet its inequality is very great. For instance, in Bedfordshire, it amounts to 2*s.* 1*d.* in the pound; in Surrey, to 1*s.* 1*d.*; in Durham, to 3½*d.*; in Lancashire, to 2*d.*; and in Scotland, to 2¼*d.*

A tax upon the gross rent of land would fall upon the landlord, and would be in fact a tax upon his annual income, and as such would fall with undue severity upon him, unless other classes of the community should be liable to a proportionate deduction from their respective incomes for the benefit of the state. But it is very difficult to levy a tax on income generally without making it fall very unequally on different kinds of income; and the mode in which an income tax is levied in this country at present (1850) is very far from being equitable. It is a sufficient objection to an income-tax, such as has been raised in England, that it is easy for a man to conceal the amount of his income which is derived from the profits of trade, or from money which he receives in the shape of wages, salary, professional fees, and the like. In the second place, an income arising from the rent of land or houses is taxed no more than an income arising from a salary, from wages, or occasional payments, such as a physician's fees; and yet the incomes from land or houses, and the other incomes here mentioned, have no resemblance except in name. The income of annuitants also is charged at the same rate as an income from land held by an owner in fee. In fact all that constitutes a man's income in the general sense of the term is charged at the same rate; with this exception, that persons whose income is under a specified amount pay nothing at all. Those who devised this unequal and unjust system of taxation saw that they must fix a limit somewhere, or they must tax the common labourer's wages as they tax the wages, salaries, fees, and other incident receipts of those who are above the class of labourers. But a tax which falls upon some persons and not on others, according as their income reaches or does not reach an arbitrarily fixed amount, is condemned by this very inequality. Lastly, the powers which are given to make investigations into the affairs of men, for the purpose of ascertaining whether they make a true return of their income, constitute a great objection to this tax; an objection so easy to comprehend as to require no explanation. That a great number of persons, the exact amount of whose income can only be known to themselves, do evade the payment of income-tax either by declaring their income under the taxable amount, or by returning less than their income, is a fact which cannot be doubted. A tax which an honest man pays to the uttermost farthing, and a tax which a knave can and does evade in whole or in part,-is the worst tax ever devised, and a discreditable measure to the statesmen who have devised or adopted it.

As to the English assessed taxes, with an equitable assessment and special exemptions in certain cases, they are capable of being made to bear a tolerably just proportion to the incomes of the individuals who pay them. They share however in the general unpopularity of all direct taxes, and they often press unequally upon particular persons. The window-tax is a bad one, because it tends to interfere directly with the proper construction of the first of all necessaries in this climate, a comfortable wholesome house. Besides this, the number of windows in a house is a very imperfect criterion of its annual value, and the house-tax which has been removed was far preferable to the window-duty, which is still retained. The direct taxes upon horses, dogs, carriages, hair-powder, armorial bearings, &c., are not objectionable. The use of such articles generally indicates the scale of income enjoyed by the contributor, and the tax is too light to discourage expenditure or to make any sensible deduction from his means.

All taxes are disliked, and the more directly and distinctly they are required to be paid the more odious they become. On this, as well as on other grounds, 'indirect taxes,' or taxes upon the consumption of various articles of merchandise, have been resorted to by most governments. It is a great merit in any system of taxation that it should be popular and not give rise to discontent. A tax that is positively injurious to the very parties who pay it without thought, is certainly not to be defended merely on the ground that no complaints are made of it; but it may be admitted as a principle, that of two taxes equally good in other respects, that is the best which is most acceptable to the people. The very facility however with which indirect taxes may be levied, makes it necessary to consider the incidents and effects of them with peculiar caution. The statesman has no warning, as in the cases of direct taxes, that evils are caused by an impost which is productive, and which every one seems willing to pay. When any branch of industry is visibly declining, and its failure can be traced to no other cause than the discouraging pressure of a tax, the necessity of relief is felt at once; but if trade and manufactures are flourishing, it is difficult to detect the latent influence of taxes in restraining that progress, which but for them would have been greater; and still more difficult to imagine the new sources of wealth which might have been laid open if such taxes had not existed, or had been less heavy, or had been collected at different times or in different ways.

Duties upon raw materials increase the price of such materials, and thus limit the power of the manufacturer to purchase them, and to employ labour in increasing their value, and in adding to the production and capital of the country. They discourage foreign commerce and the employment of shipping; for as the power of buying is restrained, so also is that of selling, and the interchange of merchandise between different countries is checked. Moreover, by increasing the price of the exported manufactures, they limit the demand for them abroad, and subject them to dangerous competition.

Similar objections may be urged against taxes upon domestic manufactures, since by increasing the price they diminish consumption, and consequently discourage the manufactures, which if left to themselves would have given employment to more capital and labour, and would have added greatly to the amount of national wealth and prosperity.

The British legislature has of late years very wisely repealed or reduced various duties upon raw materials and upon manufactures. Of the

former we may instance the customs duties on barilla; on raw, waste, or thrown silk; on cotton-wool and sheep's wool, unwrought-iron, hemp, and flax; and above all upon timber; which have been from time to time very much reduced or repealed. Of the latter, the taxes on printed goods, on candles, on glass, and on bricks and tiles, have been altogether removed; and those on malt, and on soap, have been partially remitted.

One of the chief recommendations of indirect taxes is, that, when placed upon certain articles, the payment of them by the consumer is optional. If charged upon the necessaries of life, the payment becomes compulsory, and falls with unequal weight upon labour. Competition generally reduces a large proportion of the working classes to a state which allows them little if anything beyond necessaries; consequently a duty upon these, as it will have no effect in diminishing the competition of labour and in raising wages, must reduce the comforts and stint the subsistence of labouring men.

That class of articles commonly called luxuries, of which the consumption is to some extent optional, are a fair object of taxation. Such taxes do not interfere with industry or production, but are paid out of the incomes of the contributors, and paid willingly, and for the most part without undue pressure upon their means. But in laying on taxes upon particular articles of this description care must be taken to proportion the charge to the value of the article. Excessive duties fail in the very object they have in view, by rendering the revenue less productive than moderate duties; while the causes of their failure are injurious to the wealth of the country by discouraging consumption, and to its morals by offering an inducement to smuggling.

High duties upon foreign articles imported into a country are liable to all the objections which apply to immoderate taxes upon articles of consumption, and they are chargeable with another —they diminish importation, and thereby restrict commercial intercourse and the demand for and exportation of domestic produce and manufactures.

The success of moderate duties upon articles of consumption, in encouraging the use of them, placing them within the reach of a larger number of persons, and at the same time augmenting the revenue, was never better shown than in the article of coffee. In 1824 the duty on British plantation coffee was 1*s.*, upon East India 1*s.* 6*d.*, and upon foreign coffee 2*s.* 6*d.* per lb. In 1825 those duties were reduced one-half, and the consequence was considerably more than a threefold increase in the consumption, while the revenue in 1841 had been more than doubled.

In 1835 coffee the produce of British possessions in India was admitted at the same duty as plantation coffee, viz., 6*d.* per lb., and the effect of the reduction, in encouraging the growth of the plant in India and the consumption of the berry in this country, has already been very great, and perhaps the coffee-trade of the East may as yet be considered in its infancy. In 1834, the year before the reduction, 8,875,961 lbs. were imported from the East India Company's territories and Ceylon; and in 1840, 16,885,698 lbs., or nearly double. In 1842 the duty on foreign coffee was reduced to 8*d.* a lb., and on coffee the produce of British possessions to 4*d.*; and notwithstanding so extensive a reduction the revenue has not very materially suffered. Thus reductions of existing duties are proved by these examples to increase the revenue; but whether the effect of them be immediate or deferred must depend upon a variety of circumstances.

The object of a protective duty, as it is called, is to raise artificially the price of the produce or manufactures of one country as compared with the produce or manufactures of another. A heavy tax easily effects this object, and thus prevents competition on the part of that country whose commodities are taxed, and limits the supply of those commodities in favour of the parties for whose benefit the tax was imposed. The revenue, the avowed object of a tax, so far from being improved, is sacrificed by the exclusion of merchandise, which at moderate duties would fill the coffers of the state.

Protection may be accomplished by actual prohibition of the import of particular articles, by exorbitant duties which amount to prohibition, or by such duties only as give the home producer an advantage. Duties may also discriminate between the produce of different countries, and give the preference to some, to the injury and exclusion of others. In this country all these modes of protection have been resorted to: but their impolicy has been recognised by the legislature, which, within the last few years, has advanced rapidly in the adoption of a more sound system of taxation.

Duties are called discriminating or differential when they are not levied equally upon the produce or manufactures of different countries. The object of them is to give an advantage to the country on whose commodities the tax is lightest, as compared with others. This system is condemned by the very terms in which it is expressed, its professed and its real object being, not the advantage of the country which makes the discrimination, but the advantage of some other country or some class of persons who have an interest in the products or manufactures of such other country. By the commercial policy of England, the principle of discrimination may be said to be confined to the protection of the English colonies against the competition of foreign countries. But of late years these discriminating duties have been much modified, especially in the two important articles of sugar and timber.

Duties levied upon goods exported to foreign countries are ultimately paid by the foreign consumer. However desirable this may appear to the state, whose treasury is enriched at the expense of foreigners, the expediency of such duties will depend upon peculiar circumstances, and great nicety is required in the regulation of them. If a country possesses within itself some produce or manufacture much in request abroad, and for the production of which it has peculiar advantages, it may safely impose a moderate export duty. In this manner Russia, which almost alone supplies

tallow to the rest of Europe, derives a considerable revenue from an export duty upon that article. Upon the same principle a duty upon machinery exported from Great Britain would have been politic. British machinists far excelled all others in skill and ingenuity, and foreign manufacturers were willing to pay almost any price for their machinery. Notwithstanding the prohibition, large quantities have been smuggled abroad at an enormous cost, but the difficulty and expense of evasion have been so great that foreigners have latterly almost confined their purchases, in this country, to models and drawings, and have made the machinery themselves, with the assistance of British artisans, whom they have enticed abroad by extravagant wages. If, instead of prohibiting the export, a duty of 7½ or 10 per cent. *ad valorem* had been imposed, foreign manufacturers would have paid much less for the machinery purchased by them in England than they could have had it made for abroad; there would have been a large export trade from this country, and a considerable revenue. The partial relaxation of the prohibitory law in 1825, by granting licences to export certain kinds of machinery, showed the extent to which the trade might be carried under a more liberal policy, and the 6 and 7 Vict., cap. 84, removed all restriction on the exportation of machinery. The official value of machinery exported under licence in 1840 was 593,064*l.* The repeal came into operation in August, 1843; in 1847 the exportation was 1,263,016*l.*

Heavy export duties will check the demand abroad in the same manner as they affect the consumption of commodities at home. In the same manner also they are injurious to trade and unprofitable to the revenue.

All duties whatever should be avoided upon the export of produce or manufactures which may be also sent from other countries to the same markets. They would discourage trade and offer a premium to foreign competition.

Although the temptation is great to shift taxes from one country to another by means of export duties, this temptation is equally great in all countries; and if their several governments should be actuated by the desire to make foreigners contribute to their revenue, their opportunities for carrying out such a system would probably be equal, and thus retaliations might be made upon each other, which, after all, would neutralise their efforts to tax foreigners, and leave them in the same position as if they had been contented to tax none but their own subjects. In this power of retaliation lies the antidote to the evil of one state being forced to bear the burthens of another as well as its own. Every state would naturally resist such an imposition upon its subjects, and export duties can therefore only be safely resorted to in such peculiar cases as we have noticed, where foreigners are willing to pay an increased price for commodities which they must have, and which they cannot obtain so good or so cheap from any other place.

TAXA'CEÆ, a natural order of plants belonging to the class *Gymnospermæ*, consisting of plants which are but thinly distributed on the surface of the earth. They are mostly natives of temperate parts of Europe, Asia, Africa, and America. The order yields trees which are valued for their timber, and, like *Coniferæ*, possess resinous properties. The branches of the *Dacrydium taxifolium* are used in New Zealand for making spruce-beer.

TAXES. In this place it is proposed to give a short summary of the amount and description of taxes paid in Great Britain and Ireland, whether assessed directly upon property, or collected indirectly upon articles of consumption; including not only such taxes as are paid to the general government, but also all municipal and local assessments or contributions.

United Kingdom.

The chief sources of revenue are from indirect taxes, as will be seen by the following statement for the year 1848, made up to 5th January, 1849:—

	£	s.	d.
Customs	20,999,132	3	4
Excise	14,154,054	19	9
Stamps	6,643,772	1	11
Taxes (Land and Assessed)	4,314,704	8	8
Property Tax	5,347,364	19	9
Post-Office	815,000	0	0
Crown Lands	81,000	0	0
Duties on Pensions and Salaries	4,559	5	0
Hereditary Revenues of the Crown	9,202	8	9
Surplus Fees of Public Offices	53,548	3	5
Total Ordinary Revenue	52,422,338	10	7
Other receipts	966,378	12	8
Total Revenue for 1848	53,388,717	3	3

The assessed taxes are the window-tax, tax on male servants, taxes on carriages, on horses, on dogs, armorial bearings, horse-dealers' duty, game duties, stage-coach duties, and duties on passengers conveyed for hire by carriages travelling on railways. In 1840 (3 & 4 Vict., c. 17) 10 per cent. additional was imposed on all the assessed taxes. The average rate at which the public income is collected is somewhat above 6 per cent.

Farm-houses belonging to farms under 200*l.* a year are exempt from window duty. Bachelors, except Roman Catholic clergymen, pay an additional duty of 1*l.* on male servants.

To these parliamentary taxes may be added the following local assessments:—

Poor-rates (1849)	£5,792,963	(which includes county rates, 700,000*l.*)
Church-rates	600,000	(in round numbers.)
Highway-rates	1,312,812	
Turnpike-tolls (England and Wales)	1,577,764	
Grand-jury presentments (Ireland)	1,261,446	
Poor-rates (Ireland)	1,671,148	
Total of local taxes	12,216,133	

('Parliamentary Papers,' 1839; 1841, 1842, 1850.)

Since the year 1842 considerable changes have been made in the customs. In the excise also changes have been made. The excise-duty on glass has been taken off. But, on the other hand, since the 5th of April, 1842, the income-tax has been in operation. The income-tax was imposed April 5th, 1842. In consequence of all these changes some years will elapse before it will be possible to say how far the increased consumption will make up for the direct reduction in the revenue by the diminution and repeal of taxes, and whether it will be necessary to keep the income-tax. The produce of the income-tax for 1845 was 5,261,954*l.*, and for the year ending April 5, 1848, it was 5,638,702*l.* So far however as we can judge, the experiment of reducing taxation has been successful, even if we look only to the revenue.

The tithes of Great Britain and Ireland are said to amount to 4,000,000*l.*

It is instructive to compare the present amount of taxes with that rendered necessary by a war expenditure. From 1805 to 1818 the payments into the British exchequer from taxes and loans in no one year amounted to less than 100,000,000*l.*, and in 1813 arose to the enormous sum of 176,346,023*l.*

There was published under the direction of the Poor-Law Commissioners in 1846, a valuable work entitled 'The Local Taxes of the United Kingdom, containing a Digest of the Law, with a Summary of statistical Information concerning the several Local Taxes in England, Scotland, and Ireland.' England includes England and Wales. It is remarked in the Introduction that 'these Local Taxes are of two kinds: the rates raised in defined districts; and the tolls, dues, and fees paid for particular services or on certain occasions. But those rates only will be here noticed which are authorised by general statutes or the common law; excluding such as derive their origin from special or local acts.' The rates are divided into three classes. I. Rates of independent districts, on the basis of the poor-rate. II. Rates of independent districts, not on the basis of the poor-rate. III. Rates of aggregate districts, on the basis of the poor-rate. No. I. comprehends—1, the Poor Rate; 2, the Workhouse Building Rate; 3, the Survey and Valuation Rate; 4, the Jail Fees' Rate; 5, the Constables' Rate; 6, the Highway Rates (three); 7, the Lighting and Watching Rate; 8, the Militia Rate. No. II. comprehends —1, the Church Rates (three); 2, the Sewer Rate; 3, the General Sewers' Tax; 4, the Drainage and Inclosure Rates; 5, the Inclosure Rate; 6, the Regulated Pasture Rate. No. III. comprehends—*Counties:* 1, the County Rate; 2, the Police Rate; 3, the Shire Hall Rate; 4, the Lunatic Asylum Rate; 5, the Burial Rate.—*Hundreds:* 6, the Hundred Rate.—*Boroughs:* 7, the Borough Rate; 8, the Watch Rate; 9, the Jail Rate; 10, the Prisoners' Rates; 11, the Lunatic Asylum Rate; 12, the Museum Rate.—*Counties and Boroughs:* 13, the District Prison Rates.

The nature of many of these several rates may be collected from the references given in the article RATE.

The head of Tolls, Dues, and Fees comprehends —1, Turnpike Tolls; 2, Borough Tolls and Dues; 3, Light Dues; 4, Post Dues; 5, Church Dues and Fees; 6, Marriage Fees; 7, Registration Fees; 8, Justiciary Fees.

The work published under the direction of the Commissioners, gave the estimate of the Local Taxes of England and Wales at 11,409,079*l.*

Some of the taxes are regularly increasing, and the produce of some is not known. It is assumed that the Local Taxation of England and Wales may be in round numbers twelve millions; but this estimate does not include the sums raised under special or local acts, of the amount of which sums no estimate can be formed; but the amount is very large.

A century ago the Poor-Rate was about 700,000*l.*; in 1849 it was 5,792,963*l.* In 1818 it was 9,320,000*l.* But the sums levied under the name of the Poor-Rate are expended on various purposes besides the relief of the poor.

The work published under the direction of the Poor-Law Commissioners contains a chapter on the Local Taxes of Scotland, written at the request of the Poor-Law Commissioners by J. Hill Burton, Advocate, Edinburgh. The amount of money levied by local taxation in Scotland is not accurately known. Mr. Burton gave 956,678*l.* as the approximate amount.

The rates for Ireland are given at .	£1,631,818
Tolls, Dues, and Fees	199,469
	1,831,287

In 1848 the grand jury presentments in Ireland amounted to 1,261,446*l.*, and the poor-rate raised for the year ending Sept., 1849, amounted to 1,671,148*l.*, the expenses for the same year being 2,116,482*l.*

The amount of annual local taxation of Great Britain and Ireland amounts to 14,197,044*l.* But it is observed that if the deficient information were supplied, it would appear to be at least 15,000,000*l.* a year; and this, as already observed, does not include the local taxes raised in particular places under special acts of parliament. The sum raised by general taxation in the United Kingdom for the year ended 5th of January, 1849, was 53,388,717*l.* The amount of the local and general taxation is accordingly about 68,000,000*l.* a year. The public expenditure for the year ending 5th of January, 1849, was 54,185,136*l.*, of which sum 28,563,517*l.* was paid on account of the Funded and Unfunded Debt. This leaves somewhat under 22,500,000*l.* for the rest of the general public expenditure. Accordingly the present amount of the local taxation, 15,000,000*l.*, is nearly equal to three-fourths of the public expenditure after deducting the payments on account of the Funded and Unfunded Debt.

Information about the several taxes of European States will be found in the Parliamentary Paper, No. 227, of 1842, ordered by the House of Commons to be printed, 3rd of May, 1842.

TAXICORNES, the second family of the

Heteromerous Coleoptera, in Latreille's arrangement of insects. They have no corneous tooth on the inner side of the maxillæ. They are all winged insects, with nearly square bodies, and a thorax which conceals or receives the head. They have short antennæ, and legs adapted for walking only. They live in fungi, beneath the bark of trees, or on the ground under stones. This family is divided into two tribes, of which the genera *Diaperus* and *Cossyphus* are respectively the types.

TAXO'DIUM, from *Taxus*, the name of a genus of plants belonging to the natural order *Coniferæ*. It is well known through the *Taxodium distichum*, Deciduous Cypress, which was introduced into Europe from North America as early as 1640, an elegant tree, attaining a height of 120 feet in its native soil. The first plant that is mentioned as existing in this country was grown in South Lambeth, and was raised from seeds brought from Virginia. Since then it has been introduced in various parts of Great Britain, and many fine specimens are now to be found. In America its wood is used for all the purposes to which timber is applied. In 1819, according to Michaux, almost all the houses of New Orleans were constructed of the wood of this tree. It is considered very durable, and is employed where this quality is an object.

TAXUS (*Taxus*, Latin, the Yew-Tree), the name of a genus of plants, the type of the natural order *Taxaceæ*. The species are evergreen trees, natives of Europe and North America. *T. baccata*, Common Yew, is found in every part of Britain and Ireland. It is seldom seen growing in company with its own species, but alone, or with other species of plants. It is of slow growth, attaining under favourable circumstances a height of 6 or 8 feet in ten years, and 15 feet in twenty years. The tallest yew in England is in the churchyard at Harlington, near Hounslow, which is 60 feet high. A tree continues growing for about one hundred years; it mostly ceases to grow at that age, but will live for many centuries. The yew-trees at present existing at Fountain's Abbey in Yorkshire are supposed to have attained their full growth when the abbey was erected in 1132.

The yew appears to have been employed from the earliest times in the manufacture of bows, and was used for this purpose by the nations of antiquity. The bows used by the English previous to the introduction of gunpowder were made of yew, and there are many allusions amongst English poets to this use of its wood.

The wood of the yew is used in cabinet-making. It is very hard, compact, and of a fine close grain, which arises from the smallness of its annual layers, 280 being sometimes found in a piece not more than 20 inches in diameter. It is also much used by the turner for making snuff-boxes, musical instruments, &c.

There are several varieties of the common yew; the most remarkable is the Irish Yew, which Professor Lindley has made a distinct species, *Taxus fastigiata*. The Canada, or North American Yew, is described as a species, *T. Canadensis*. The leaves are narrower and smaller than those of the common yew. It is found native in Canada.

TAY. [PERTHSHIRE.]

TAY'GETUS. [LACONICA.]

TAYLOR, JOHN, was born in the city of Gloucester in 1580. His education was very limited. He came to London, and was bound apprentice to a waterman, an occupation from which he derived his title of 'Water-Poet.' He had however for fifteen or sixteen years some situation in the Tower of London; and he afterwards kept a public-house in Phœnix-Alley, Long Acre.

Taylor was not satisfied with the distinction which his literary productions procured for him. He once undertook to sail from London to Rochester in a boat made of paper, an exploit which nearly cost him his life. A journey which he performed by land is described in one of his tracts, entitled the 'The Pennyless Pilgrimage, or the Moneyless Perambulation of John Taylor, alias the King's Majesty's Water Poet; how he travelled on foot from London to Edinburgh in Scotland, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging.' Of a sort of voyage which he afterwards performed he published, as usual, an account himself, 'John Taylor's last Voyage and Adventure, performed from the 20th of July last, 1641, to the 10th of September following; in which time he passed with a sculler's boat from the citie of London to the cities and townes of Oxford, Gloucester, Shrewsbury, Bristol, Bathe, Monmouth, and Hereford.' Taylor died in 1654.

His publications, which amount to upwards of eighty, are some in prose, some in verse, and many both in prose and verse. As literary productions they are of little or no value; but they afford many interesting glimpses of the state of society of the times in which he lived.

TAYLOR, JEREMY, was born at Cambridge in 1613. His ancestors, of whom Dr. Rowland Taylor, the martyr, who was burnt at Aldham near Hadleigh, in 1555, was one, had been wealthy and respectable, but the family had somewhat decayed. Taylor in his fourteenth year was entered at Caius College, Cambridge, as a sizar. At little more than twenty, having taken the degree of M.A. and been admitted to holy orders, he attracted the notice of Laud, who had him settled at Oxford, where, by the interposition of the archbishop, in 1636 he was nominated to a fellowship. In 1637-8 he was presented by Juxon, bishop of London, to the rectory of Uppingham in Rutlandshire. In the civil wars he followed the fortunes of Charles, whose chaplain he was, and in 1642, when the king was at Oxford, he published there his 'Episcopacy asserted against the Acephali and Aerians New and Old.' Charles rewarded Taylor by commanding his admission to the degree of D.D., but this advantage was overbalanced by the loss which Taylor encountered in the same year, the sequestration of his rectory by the parliament. In 1647, when the crisis of the civil war impended, he published his discourse, 'The Liberty of Prophesying.' After the defeat of the royalists Taylor was repeatedly imprisoned, but only for short periods; he suffered much pecuniary want; and

while in Ireland, whither he went in 1658, was charged by an informer with having used the sign of the cross in baptism, and dragged before the Irish privy council. A fever was the consequence of his arrest, which probably induced the council to act leniently towards him.

In 1660 he travelled to London to prepare for publication his 'Ductor Dubitantium,' when he attached his signature to the declaration of the royalists of their confidence in Monk. Taylor was thus brought under the notice of Charles II., who nominated him to the bishopric of Down and Connor, to which he was consecrated in Jan., 1661; in the following month he was made a member of the Irish privy council; and in the next was intrusted with the administration of the small see of Dromore. In the same year he was elected vice-chancellor of the university of Dublin.

In his new station Bishop Taylor laboured with much zeal for the establishment of the Protestant religion. He was attacked by fever, Aug. 3, 1667, at Lisburn, and died in ten days.

The writings of Jeremy Taylor may be brought under four descriptions: practical, theological, casuistic, and devotional. The first comprises his 'Life of Christ,' which he published in 1653; 'Contemplations on the State of Man,' a posthumous work; 'Holy Living and Holy Dying,' 1651; and his Sermons, which appeared at various periods. 'The Liberty of Prophesying' (that is, of interpretation) is the most popular in the second division of Taylor's writings. The 'Ductor Dubitantium' has been considered the most learned work on casuistry which has appeared in the English language. On devotional subjects the character of Taylor's mind fitted him to write with most success. In these we find his most glowing language, his aptest illustrations, and his most poetical conceptions and expressions.

TAYLOR, SILAS, otherwise called Domville or D'Omville, by Antony Wood, was born at Harley near Much-Wenlock, in Shropshire, July 16, 1624, and after being educated at Shrewsbury and Westminister schools, became a commoner of New Inn Hall at Oxford in 1641. He joined the parliamentary army, in which he had a captain's commission. After the war he was appointed by the interest of his father sequestrator of the royalists in Herefordshire, in discharge of which office he conducted himself so as to conciliate the king's party; and on the restoration he was appointed commissary of ammunition, &c., at Dunkirk, and about 1665 made keeper of the king's stores and storehouses for shipping at Harwich. He died Nov. 4, 1678.

Taylor left materials for a history of Herefordshire, which are now among the Harleian MSS. His published works are 'The History of Gavelkind,' London, 1663, 4to; and a 'History of Harwich,' published from his papers by Samuel Dale, in 1730 and 1732.

TAYLOR, BROOK, was born at Edmonton, August 18, 1685, and was the son of John Taylor, of Bifrons House in Kent. John Taylor was the son of Nathaniel, who, to use a phrase of his own diary, 'tugged and wrestled with the Lord in prayer,' and was member (elected by Cromwell's summons) for the county of Bedford in the (Barebones) parliament of 1653. Brook Taylor's father was the most despotic of parents: his son was educated at home, where, besides enough of the usual learning to enable him to begin residence at St. John's, Cambridge, in 1701, he became excellent both in music and painting. The paintings of the future writer on perspective are represented as not needing the allowance always made for amateurs, but as capable of bearing the closest scrutiny of artists. At Cambridge he applied himself to mathematics, and acquired early the notice of Keil, Machin, and others. Besides papers in the Philosophical Transactions he published the following celebrated works:—

1715. Methodus Incrementorum directa et inversa. Londini.

1715. Linear Perspective, or a new method of representing justly all manner of objects as they appear to the eye in all situations. London.

1719. New Principles of Linear Perspective, or the art of designing on a plane the representations of all sorts of objects in a more general and simple method than has been done before. London. A different work from the former.

In January, 1714, he was chosen secretary of the Royal Society. In 1716 he visited his friends Montmort and Conti at Paris. He had just had a warm correspondence with the former on the Newtonian doctrine, and on the tenets of Malebranche. His posthumous work, or rather tract, the 'Contemplatio Philosophica,' seems to contain his latest thoughts on the opinions of Malebranche and Leibnitz. In France he formed the acquaintance of Bishop Bossuet and Lord and Lady Bolingbroke, with all of whom Sir W. Young has printed some of the correspondence. He returned to England in February, 1717; but his health was now impaired, and, throwing up the secretaryship in October, 1718, he retired to Aix-la-Chapelle. On returning to England early in 1719, he seems to have abandoned the mathematics almost entirely. Among his papers of this period are essays on Jewish Sacrifices, and on the lawfulness of eating blood. At the end of 1720 he went to visit Lord Bolingbroke at La Source near Orleans, and returned to England in 1721. After the middle of this year he wrote nothing for publication, nor could his grandson find anything of a mathematical character among his papers, with the exception of reference to a treatise on logarithms, which it seems he had placed in the hands of his friend Lord Paisley (afterwards Abercorn) to prepare for the press, but which was never printed.

At the end of 1721 he married a young lady of small fortune, a circumstance which occasioned a rupture with his father. Some months after his marriage, and when there appeared hope of issue, his wife was informed that the birth of a son would probably accomplish a reconciliation between her husband and his father. On this she fixed her mind with such earnestness, that on finding herself in due time actually delivered of a son, she 'literally died of joy:' the infant also perished. This melancholy event led to the reconciliation the hope of which had caused it, but

not till the autumn of 1723. Dr. Taylor returned to his father's house, and in 1725, with his father's consent, married the daughter of a neighbouring proprietor. In 1729 he succeeded to the family estate by the death of his father, and in the following year his wife died in giving birth to a daughter, afterwards the mother of the writer of the memoir from which we cite. This blow was fatal. Lord Bolingbroke, now settled again in England, endeavoured to divert the thoughts of his friend by inducing him to pass some time in his house, but in about a year after the stroke, Dr. Taylor died of decline (in London, we suppose), December 29, 1731, and was buried in the churchyard of St. Anne's, Soho.

The 'Methodus Incrementorum' is the first treatise in which what is at this day called the Calculus of Finite Differences is proposed for consideration. Besides what are now the most common theorems in this subject, there are various purely fluxional or infinitesimal theories, such as the change of the independent variable, integrations, J. Bernoulli's series, &c., and various applications to interpolation, the vibrating chord, the catenary, dome, &c., centre of oscillation and percussion, law of density of the atmosphere, refraction of light. The first enunciation of the celebrated theorem is as follows:—

PROP. VII. THEOR. III.

Sint x et z quantitates duæ variabiles, quarum z uniformiter augetur per data incrementa z, et sit $nz = v$, $v - z = \dot{v}$, $\dot{v} - z = \ddot{v}$, et sic porrò. Tum dico quod quo tempore z crescendo fit $z + v$, x item crescendo fiet

$$x + x\frac{v}{1z} + x\frac{v\dot{v}}{1.2z^2} + x\frac{v\dot{v}\ddot{v}}{1.2.3z^3} +, \text{ &c.}$$

Corollary I. expresses the corresponding theorem for decrements.

COROLL. II.

Si pro Incrementis evanescentibus scribantur fluxiones ipsis proportionales, factis jam omnibus $\ddot{v}$, $\dot{v}$, v, $\dot{v}$, $\ddot{v}$, &c., æqualibus quo tempore z uniformiter fluendo fit $z + v$ fiet x,

$$x + x\frac{\dot{v}}{1\dot{z}} + x\frac{\ddot{v}^2}{1.2\dot{z}^2} + x\frac{\dddot{v}^3}{1.2.3\dot{z}^3} +, \text{ &c.}$$

vel mutato signo ipsius v, quo tempore z decrescendo fiet $z - v$, x decrescendo fiet

$$x - x\frac{\ddot{v}}{1\dot{z}} + x\frac{\ddot{v}^2}{1.2\dot{z}^2} - x\frac{\dddot{v}^3}{1.2.3\dot{z}^3} +, \text{ &c.}$$

Taylor does not make much use of his own theorem in the 'Methodus Incrementorum,' but he shows his command over it in his paper on the roots of equations, in which he extends Newton's method to other than algebraical equations.

One would have supposed that such a theorem as that of Taylor, the instant it was proposed, would have been hailed as the best and most useful of generalisations. Instead of this, it sunk, or rather never rose, till Lagrange pointed out its power.

TAYLOR, JOHN, LL.D., born about the year 1703, at Shrewsbury, received his early education at the grammar-school of his native place, and afterwards went to Cambridge, where he entered St. John's College, of which he became a fellow in 1730. The great reputation which he soon acquired as one of the best Greek scholars in the university, procured him the office of librarian of the university library, which however he afterwards exchanged for that of registrar of the university. He produced an edition of the orations of Lysias, London, 1739, 4to. The study of the Attic orators led him to the study of law, and in 1741 he was admitted an advocate in Doctors' Commons, and the year after he took his degree of doctor of laws. In 1744 he was made chancellor of Lincoln, and soon afterwards he took holy orders. He was successively made archdeacon of Lincoln, rector of Lawford in Essex, and canon residentiary of St. Paul's, a lucrative office with next to nothing to do. He died in 1756. Besides an edition of the oration of Demosthenes against Midias, and that of Lycurgus against Leócrates, and an edition of the Greek orators, which he did not live to finish, he wrote 'Elements of Civil Law,' a work which displays great knowledge of the subject, but which is ill adapted for the use of beginners. An abridgment of it appeared at London in 1773, entitled 'A Summary of Roman Law.'

TAYLOR, SIR ROBERT, born in 1714, was the son of a wealthy but extravagant London stonemason. His father bestowed on him only a common school education, then placed him under Sir Henry Cheere, a sculptor, and afterwards furnished him with just sufficient money to proceed to Rome. His studies in Italy were however of no long continuance. He was summoned home, and on his arrival found that his father was dead, and had left no property. Thrown entirely upon his own resources, he began business as a statuary. Among his principal works in sculpture are the figure of Britannia at the Bank of England, and the bas-relief on the pediment of the Mansion-House, London. He afterwards abandoned sculpture for architecture. In 1756–58 he was employed in the alterations of old London Bridge in conjunction with Dance, and thenceforth upon a number of buildings both public and private, very few of which display much architectural taste, and least of all any of that richness in decoration and detail which might have been expected from one who had been brought up and had practised as a sculptor. He died at his own house in Spring Gardens, Sept. 27, 1788, after having realised a fortune of 180,000*l*. Taylor was knighted when sheriff of London in 1783.

TAYLOR, THOMAS, was born in London on the 15th May, 1758. At a very early age he was sent to St. Paul's school, and after remaining there about three years he was placed under the care of a relation who held a situation in the dockyard at Sheerness, with whom he resided several years. During this time he applied himself to the study of mathematics, and also obtained some knowledge of chemistry: he next became a pupil of the Rev. Mr. Worthington, a

dissenting minister, who possessed considerable classical acquirements, intending to complete his studies at Aberdeen with a view to the ministry. But a premature marriage and pecuniary difficulties compelled him to relinquish this plan, and to accept a junior clerkship in Messrs. Lubbock's banking-house. While in this employment he devoted his spare hours to the study of Plato and Aristotle and their commentators. At this time, and to the end of his life, Mr. Taylor always devoted at least six hours of every day to study. Poverty, and the difficulties attending it, were no obstacles to him. He afterwards got some pupils, to whom he taught the languages and mathematics. Having been appointed to the office of assistant-secretary to the Society for the Encouragement of Arts, Manufactures, and Commerce, which he held for several years, he gave up his place in the banking-house. It was in this situation that he made a more extensive acquaintance among learned and scientific men of all professions, and among men of various ranks who are promoters of arts and sciences, than usually falls to the lot of an obscure individual. But he made something more than mere acquaintance; he acquired many friends who were able and willing to assist him in all his undertakings, and with whose help he finally accomplished all that he had in view, which was to translate the works of all the untranslated ancient Greek philosophers. It was by making friends chiefly that Mr. Taylor contrived to print works that must have cost more than 10,000*l.*, and upon the whole produced no pecuniary profit. The Duke of Norfolk printed Plato, and from some unaccountable whim locked up nearly the whole edition in his house, where it remained till long after his decease, but he was attached to Mr. Taylor, and frequently made him his companion at Arundel. Mr. Meredith, a wealthy tradesman retired from business, was a man possessed of sound mental faculties, with no aversion to exercise them. Having read Plato he wished also to read Aristotle in an English translation, and Mr. Taylor was ready to help him to it upon no other condition than his undertaking to print it, which he did; and though he made a losing speculation of it, by printing too few copies, he was so well satisfied with Mr. Taylor's exertions, that he not only assisted him in bringing out some of his minor publications, but settled a pension of 100*l.* a year upon him, which he enjoyed till his death. Among Mr. Taylor's minor works some will be found dedicated to persons who printed them upon similar terms, and in a few cases gave him the benefit of the whole edition. He never exacted payment for his labour, except in one or two cases with the booksellers, and then he had little enough. But with such means he got over all his difficulties; and he had some, for he was twice married and had several children. His income altogether was about 200*l.* a year.

Mr. Taylor, during the last forty years of his life, resided in a small house at Walworth, dividing his time between his labours and his attentions to his friends and family. He died on Nov. 1, 1835, of a very painful disease in the bladder, which he bore with extraordinary fortitude. He was an Academician by profession and a Stoic in practice; a sincere friend and a delightful companion. Of his numerous works and translations a list is given in the 'Penny Cyclopædia.' His translations are by no means free from faults, but what he did in his circumstances is wonderful. There are few such instances of laborious devotion to a literary undertaking as his long series of translations.

TAYLOR, WILLIAM, was born at Norwich in 1765. He was the only child of an eminent merchant of that city. He became a pupil of Mr. Rochemont Barbauld, the Unitarian minister, at Palgrave; and to Mrs. Barbauld, better known as Miss Aikin, Taylor was indebted for much assistance in his early studies. At the age of fourteen he was placed in his father's counting-house at Norwich, and shortly afterwards he was sent on the Continent for the purpose of perfecting himself in the French and Italian languages. After his return to England he spent two years in his native city, and then proceeded to Germany, where he imbibed a taste not only for the literature but for the philosophy of that country, a taste which ever afterwards characterised his writings. On his second return to Norwich, at the age of eighteen, his time was chiefly occupied in making various contributions to the periodicals, and in translations from the best German writers. A poetical translation of the 'Lenore' of Bürger was the first publication by which he became generally known. These and other translations were afterwards collected, and published in 1830, under the title of 'Survey of German Poetry.'

Meantime Taylor had not escaped the revolutionary fever of the day. He belonged to a democratic club at Norwich, and distinguished himself in its debates. In 1798 he became acquainted with Southey, whose political opinions in early life were similar to his own. An interesting collection of their correspondence will be found in the biography of Taylor by Robberds, published in 1843.

Very shortly afterwards Mr. Taylor retired from the management of his father's business; and in 1802 he accepted the management of 'The Norwich Iris.' This paper became the organ of the party to whose political opinions he was attached; but it was given up after two years. He then applied himself to writing for the periodical reviews. The 'Monthly Review' was the work in which the greatest number of his contributions appeared. In 1806 he gave to the public his version of Lessing's 'Nathan the Wise.' A succession of pecuniary losses which soon afterwards occurred, the increase of years, and premature infirmities, diminished his energies, and his later productions did not add to his fame. Among his last works was a collection of short essays on English Synonyms. He died in March, 1836.

TAYLOR'S THEOREM. [TAYLOR, BROOK.]

TCHAD, LAKE. [SOODAN, xi., 208.]

TEA. [THEA.]

TEA, PARAGUAY, or MATE', is the produce of a plant belonging to the family *Aquifoliaceæ*. It was formerly supposed to be the produce of the *Ilex vomitoria*, which is found in North America,

in the Carolinas, and Florida; but, from specimens sent from Brazil to Mr. Lambert, it appears to be a distinct species, which he has named *Ilex Paraguanensis*. It is a shrub attaining the size of the orange-tree. The leaves of this shrub are in great repute amongst the inhabitants of South America, and are used in infusion in a similar manner to the tea of China. Upwards of 5,000,000 lbs. of the leaves of this tree are annually collected in Paraguay, and are sent to Chili and Buenos Ayres. After the branches have been cut away, the ground is heated by means of a fire, and the branches, being laid upon the heated ground, are dried, and afterwards they are beaten and pressed into bags, in which state it comes into the market. The plant when used is steeped in boiling water, to which a little sugar and sometimes lemon-juice is added. It is drunk out of a vessel called *Maté*, which has a spout perforated with holes for the purpose of preventing the powdered herb from passing out with the fluid. The Creoles are passionately fond of this infusion, and rarely partake of a meal without it. The properties of this plant are sedative and stimulant.

TEAK. [TECTONA.]

TEAL (*Querquedula Crecca*, Steph.; *Anas Crecca*, Linn.), is one of the most beautiful of our European ducks, and one which annually breeds on the borders of the lakes and large ponds of our island, although the great summer rendezvous of the species is in the high northern latitudes. The Teal of North America is distinct from that of Europe and Asia. See Gould's 'Birds of Europe,' Yarrell's 'British Birds,' Selby's 'Illustrations.' [DUCKS.]

TEAZLE (*Dipsacus Fullonum*) is a plant which grows wild in the hedges, but an improved variety is carefully cultivated in those districts of England where cloth is manufactured. It is used for the purpose of forming a species of brush with which the finer hairs of the woollen fabric are drawn to the surface, where they produce what is usually called the *nap* of the cloth. The teazle has a fine hooked awn, which very readily insinuates itself into the woollen web, and draws out with it some of the fine fibres of the wool; these are afterwards shorn smooth, and leave the cloth with the fine velvet-like nap which is its peculiar appearance.

Teazles will grow in any soil; but they grow strongest and best in a stiff loam. They require the soil to be in good heart, and are supposed to exhaust it much; but no great portion of manure is required to obtain a good crop. The wild teazle which grows in hedges appears at first sight to be the same as the cultivated variety; but it is of no use to the cloth-worker, from the weakness of the awns, which break off, instead of drawing the wool out of the surface of the web.

The growing of teazles is a peculiar trade, and a kind of speculation, for the crop is very precarious. The teazle-grower hires a piece of ground suited to his purpose from the farmer for two years, and pays a considerable rent.

TEBALDE'O, or TIBALDE'O, ANTONIO, born at Ferrara about 1463, studied medicine, but afterwards devoted himself chiefly to literature, both Italian and Latin. The first edition of his Italian poems is entitled 'Sonetti, Capitoli, e Rime, chiamate Opere d'Amore,' 4to., Modena, 1498: they were reprinted several times at Milan, Venice, and other places. In 1519 appeared at Milan 'Stanze nuove ad un Vecchio che non amando in Gioventù fu costretto ad amare in Vecchiezza.' Tebaldeo afterwards applied himself successfully to Latin poetry. He was for a time at the court of Mantua, and afterwards settled at Rome, where he became a favourite of Leo X. After Leo's death Tebaldeo fell into distress, and died at Rome in 1537.

TECO'MA, a genus of plants belonging to the natural order *Bignoniaceæ*. The species are natives of the Old and New World in tropical and subtropical climates. They are all elegant plants, and well worthy of cultivation. *T. radicans* is a native of North and South Carolina, of Florida, and Virginia. This plant has been a great favourite in this country. It grows against a wall by throwing out roots from its branches in the same manner as ivy. The flowers grow from the ends of the branches in large bunches, and the tube of the corolla gradually swells out in the form of a trumpet; hence this and some of the species of Bignonia have been called Trumpet-Flowers. *T. stans* is a small tree, native of various parts of South America, the West Indies, and Mexico.

TECTIBRANCHIA'TA, Cuvier's name for his fourth order of Gastropods, described by him as having the branchiæ attached along the right side, or on the back, in form of leaves (feuillets) more or less divided, but non-symmetrical. The mantle covers them more or less, and contains nearly always in its thickness a small shell. The *Tectibranchiata* approach the *Pectinibranchiata* in the form of the organs of respiration, and live like them in the waters of the sea, but they are all hermaphrodites, like the *Nudibranchiata* and the Pulmoniferous mollusks.

The following genera are comprehended by Cuvier under this order:—*Pleurobranchus*, Cuv.; *Pleurobranchæa*, Meckel (*Pleurobranchidium*, Bl.); *Aplysia*, Linn.; *Dolabella*, Lam.; *Notarchus*, Cuv.; *Bursatella*, Bl.; *Akera*, Müll.; *Gastropteron*, Meckel; and *Umbrella*, Lam.

TE'CTONA, a genus of the natural family of *Verbenaceæ*, so named by Linnæus from the Indian name (*Tekka*) of the Teak-Tree, which is a native of different parts of India, as well as of Birma, chiefly along the banks of the Irawaddy, and of the islands from Ceylon to the Moluccas. The Teak-Tree grows to an immense size, and is remarkable for its very large leaves, which are from 12 to 24 inches long and from 8 to 16 broad, and are compared by Oriental writers to the ears of the elephant. The flowers are small, white, and very numerous.

From extensive experience teak timber has been found the most valuable timber for shipbuilding, and has been called the oak of the East. The wood is light, brownish-coloured, easily worked, but at the same time strong and durable. It is soon seasoned, and, from containing a resinous oil, resists the action of water, as well as insects of all kinds.

TEES. [DURHAM.]

TEESDA'LIA, a genus of plants belonging to the natural order *Cruciferæ* and the suborder *Angustiseptæ*. *T. nudicaulis* is the *T. Iberis* of De Candolle. It is found in sandy and gravelly places in England, France, Germany, Denmark, and Sweden. It is the only British species. *T. lepidium* is a native of Europe, particularly of Spain.

TEETH. The organs of prehension and mastication, situate in the jaws of animals, have a very complicated structure. The parts entering into the composition of the teeth are three: *dentine*, or *tooth-substance; enamel;* and *cement*, or more properly *tooth-bone*. The enamel invests the more prominent parts of the crown, from which points it gradually diminishes in thickness, till it terminates in a line on the neck of the tooth. The cement, or dental bone, is thickest at and near the end of the root, and gradually becomes thinner as it advances towards the crown of the tooth. In a tooth that has been used for some little time, the cement terminates where the enamel commences, but there is reason to believe that a thin layer is continued over the enamel. Of these tissues, dentine forms the great bulk of the tooth. The pulp-cavity occupies the centre of the dentine, and on its surface are superimposed the enamel and the tooth-bone, the former investing the crown and the latter the surface of the fang. These two tissues form a layer of variable thickness in different parts of the teeth. This layer however is soon worn off when the tooth comes into use. If the enamel and cement be removed from a tooth, and the dentine alone allowed to remain, the tooth still retains much of its original shape, losing most at the two extremities, while in point of size the loss sustained is comparatively slight; thus showing the dentine to constitute by far the greater portion of the tooth. [DENTITION.]

TEFLIS. [TIFLIS.]

TEHERAN. [PERSIA.]

TEIGN. [DEVONSHIRE.]

TEIGNMOUTH. [DEVONSHIRE.]

TEIGNMOUTH, JOHN SHORE, LORD, was the eldest son of Thomas Shore, Esq., sometime of Melton in Suffolk. He was born, it is believed, in Devonshire, Oct. 8, 1751. He went to Bengal in 1769, as a cadet in the Company's civil service. In 1773 he was appointed Persian translator and secretary to the Provincial Council of Moorshedabad; and this was followed by a seat at the Calcutta revenue board, which he retained till the dissolution of the board in 1781, when he was appointed second member of the general committee of revenue. In 1785 he accompanied his friend Warren Hastings to England. In April, 1786, he set out again for Calcutta, having been appointed one of the members of the Supreme Council under Lord Cornwallis. To Mr. Shore was attributed the new settlement, in 1789, of landed property in the presidency of Bengal. The new judicial system, introduced towards the close of Lord Cornwallis's government in 1793, also owed its establishment in a principal degree to Shore. On the retirement of Cornwallis, Aug., 1793, Shore, who had been made a baronet in the preceding year, was appointed to succeed him as governor-general; and he held that high office till 1797, when he was created an Irish peer by the title of Baron Teignmouth.

Upon the death of Sir William Jones, in April, 1794, Sir John Shore was elected president of the Asiatic Society. After his return home Lord Teignmouth published, in 1804, a 4to. volume, entitled 'Memoirs of the Life, Writings, and Correspondence of Sir William Jones;' and in 1807 he produced an edition, in 13 vols. 8vo., of Jones's Works, with this Life prefixed. In 1804, on the formation of the British and Foreign Bible Society, Lord Teignmouth was elected its first president. He was appointed one of the commissioners for the affairs of India, April 4, 1807, and was sworn of the Privy Council. His death took place Feb. 14, 1834.

TELEGRAPH (from τῆλε, 'distant,' and γράφω, 'write'), a contrivance for communicating intelligence to a distance, usually by means of preconcerted signals, to which some conventional meaning is attached. In France the name *Semaphore* is often used. As the *Electric Telegraph* is rapidly superseding all others, a very brief notice of the older method will suffice.

Most of the older telegraphs consisted of boards or wooden arms, which, according to the positions assumed, signified the letters of the alphabet. The kind generally used in France at the end of the last century was the T Telegraph of M. Chappe. Four arms shaped something like a T, were moved on three joints at the upper angles. M. Chappe communicated his intelligence letter by letter, and simplified the movements by using an alphabet of only sixteen letters. Such telegraphs were first erected on a line commencing at the Louvre, in Paris, and proceeding by Montmartre and other elevated points to Lisle, in order to communicate between the Committee of Public Safety and the combined armies in the Low Countries.

The advantages of such extraordinary celerity of communication were so obvious that, in England and other countries, many plans were immediately brought forward, some of which differed materially from that which had been successfully put in practice in France. These plans are mostly separable into two classes: shutters which open or close certain apertures made to receive them; or arms moveable on pivots. A shutter-apparatus, submitted to the Admiralty in 1795, by Lord George Murray, was adopted in the first government line of telegraphs established in England, in 1796, between London and Dover. It was employed by the Admiralty until 1816.

In 1816 it was determined to change the Admiralty telegraphs into semaphores constructed on the principle of those used in France, with the improvements suggested by Sir Home Popham. These semaphores had been introduced on the French coast in 1803. They consisted of upright posts with two or three moveable arms. Sir Home Popham's telegraph had two arms on one post; but as they were mounted upon separate pivots, each of them could assume six different positions, and the two together were capable of affording 48 signals. This kind of telegraph continued to

be used at the government stations till the introduction of the electric telegraph.

Several modes of telegraphic communication without machinery, or with something which may be held in the hands, have been devised, especially for the purpose of directing military operations, or of conveying speedy intelligence in time of war, where no line of ordinary telegraphs can be established. One such method was by circular discs of wood held by men in particular positions; another by a white handkerchief varied in position; another by two small flags; and another by stationing a few men in pre-arranged positions, &c.

Marine telegraphic communication is an object of even greater importance than that on land, since there are many circumstances which render communication between vessels at sea impracticable by any other means than by signals, and that sometimes in cases of the greatest emergency. But, although naval signals have been necessarily long used, and flags of various forms and colours have been extensively employed for the purpose of making them, it was not till within a comparatively recent period that they were reduced to anything like an efficient telegraphic system. Lord Howe proposed a system of numbering the flags used as signals, and also prepared a signal-book which was long used by the Admiralty. An improved code of signals, suggested by Sir Home Popham, was afterwards adopted. A very useful system of flag telegraphing was introduced a few years ago by Mr. Watson, for the use of commercial shipping, and for maintaining communication between a vessel at sea and any of the stations on the coasts of the British islands, whence communication might be made by telegraph inland.

TELEGRAPH, ELECTRIC. It is chiefly to the joint labours of Messrs. W. F. Cooke and Professor Wheatstone that electric telegraphs owe their practical application. Their telegraph, which was patented in 1837, acted upon principles founded on Oersted's celebrated discovery, that a magnetic or compass needle may, through the agency of a voltaic current, be invested with an artificial polarity. As a natural stream of electricity passing round the circumference of the earth causes magnetic needles in general to be deflected at right angles to its course, or towards the north and south poles, so an artificial stream of electricity of adequate strength will cause magnetic needles placed within its influence to be similarly deflected at right angles to its course, whatever that may be. If then a magnetic needle were placed parallel and near to any part of a conducting wire of any length, the transmission of an electric current from a voltaic battery would cause the needle to change its position, so as to stand during the continuance of the current at right angles to the wire, being turned in one direction or the other according to the course of the current. If this deflexion of the needle were limited by two fixed stops placed respectively at the two sides of one of its poles, the motion of that pole to one stop might evidently constitute one signal, and its motion to the other stop another signal. The power of a single wire in causing this deviation of a needle is very small, but in a short time Professor Schweiger invented the Multiplier, as he called it, in which the needle, being surrounded with many successive coils of insulated wire, is acted upon by the joint force of all. This instrument, commonly known in England as the Galvanometer, has been of the most important use, as, under a somewhat different form, this discovery now forms the basis of the Electric Telegraph, which has spread so extensively over England, the Continent of Europe, and North America. The first line was laid down upon the London and Blackwall Railway; the second from London to West Drayton; and the third (in 1849) from London to Gosport.

In Messrs. Cooke and Wheatstone's first apparatus there were five needles, arranged with their axes in a horizontal line. The needles when at rest hung vertically, by reason of a slight preponderance given to their lower ends. Each electro-magnetic coil was connected with one of the long conducting wires at one end, and was united at the other with a common rod of metal, which joined together the similar ends of all the coils. The current was transmitted from the opposite end of the wires (where an appropriate set of five pairs of finger-keys, for making the connections with the battery, was placed) through two of the wires at once. In accordance with the keys which were pressed down, the needles assumed various positions with respect to each other; and these were made to indicate signals according to the entries in a signal book. The instruments at the two stations were always rendered reciprocating; that is, at each end of the line were placed an instrument, a set of finger-keys, and a voltaic battery, so that either station could transmit or receive a signal. By a beautiful arrangement, a bell or alarum could be rung, when the attention of the clerk at the distant terminus was required.

In the early part of 1838 Mr. Cooke obtained a patent for some further improvements of this apparatus. The chief of these improvements was one by which any number of intermediate instruments might be introduced between the two terminals, and any intelligence rendered simultaneously visible in all or in any of them, as required. Furthermore any one of these instruments could be put in communication with the rest, either generally or in part only. Improvements were also introduced in the mode of protecting and insulating the wires. Dr. Steinheil constructed an electric telegraph between Munich and Bogenhausen in 1837. In his telegraph he availed himself of the conducting power of the earth, whereby he was enabled to reduce the cost of erection. The earth in fact occupied the place of the return wire. All that is necessary to enable this to be effected, is that the wire which connects the two ends of the metallic conductor with the earth, shall be carried to a sufficient depth below the surface to be always in contact with moist earth or with water; and that it shall be at this point attached to a plate or piece of metal, of about two or three feet superficial.

The electric telegraph invented by Professor Morse, of America, in 1837, was essentially a registering instrument, the various signals being traced on a strip of paper. An electro-magnet was so

placed as to be within attracting distance of an armature fixed to the shorter arm of a lever, of which the longer end carried a pencil projecting sideways from it, and pressed lightly against a sheet of paper. This paper was made to travel slowly beneath the pencil. So long as no attractive power was exerted by the electro-magnet, the pencil would continue to trace a straight line as the paper moved onwards; but on momentarily making the circuit with the battery, the armature was drawn to the electro-magnet, and the pencil, carried by the arm of the lever upwards, made an angular mark, like the letter V reversed, on the paper. These angles might either be joined in groups, by rapidly succeeding completions of the circuit, or they might be separated by longer or shorter spaces of straight line. The nine digits were represented by corresponding numbers of angles, and these were combined so as to form all possible numbers. In the telegraph constructed by Morse in 1844, between Baltimore and Washington, a different mode of recording the signals was adopted. The use of the pencil was found objectionable, from its so frequently requiring fresh pointing, and from the risk of breakage. The same arrangements were retained in regard to the paper, but it was made in its course to pass under a roller having a groove around it. The long arm of the lever carried a blunt steel point, standing out from its upper surface, vertically under the groove in the roller. When therefore the arm of the lever was elevated, by the attraction of the magnet upon the armature, the steel point pressed the paper into the groove and produced an indentation. If the attraction were momentary, a depressed point was produced; but if the action were continued for a longer time, a lengthened depression was the result, as the paper was drawn on. The combinations of these two kinds of marks denoted the various letters and figures. In his first instrument, Morse produced the requisite groups of angles by means of type having as many projecting ridges or teeth as there were to be angles. These being arranged in a frame, as required for the message, made the successive contacts with the battery as they were drawn under a lever or spring. Subsequently however a single key was used, by depressing which with the finger the circuit might be completed when necessary.

In the year 1837 Mr. Davy of London obtained a patent for an electric telegraph, the chief peculiarity of which consisted in the method of registering or recording the various communications, by causing the current of a supplementary battery to pass through a riband steeped in a solution of iodide of potassium and starch. The salt being decomposed by the current, a blue spot was produced by the combination of the iodine with the starch, and the position of one or more of these spots across the breadth of the riband determined the nature of the signal transmitted. The person who is to communicate has an apparatus, in which, by depressing different keys, he can transmit the electricity in one or other direction through any wire, making it return either by a spare wire, or by the earth; or he can employ another of the signalling wires to return the current.

In 1840 Professor Wheatstone patented his electro-magnetic telegraph, in which the indicating power was the magnetisation of soft iron by the electric current. The object of the invention was to produce, by excitation and cessation of the magnetic power in pieces of soft iron, certain determinate and definite movements of rotation, in dials or indicators; by which movement signals might be given, of various kinds and in various modes. One part of the apparatus is the Communicator, a wheel or disc, on the edge of which are alternately arranged pieces of iron and of ivory, the one a conductor and the other a non-conductor of electricity. A metal spring presses on this edge while the wheel revolves, and is connected also with the galvanic apparatus, in such a way that when the spring is in contact with the iron, a galvanic circuit is completed, but when in contact with the ivory the circuit becomes broken. Thus alternations of action are produced, which by ingenious mechanism are made the means of transmitting impulses or symbols through the telegraphic wire. This telegraph requires only a single wire for its use, the return of the current being provided by the earth. One application to which Professor Wheatstone found his invention suitable was that of an Electric Clock, by adapting his wheel and galvanic apparatus to the action of the escapement wheel of a common clock. Another application was that of enabling the machine to print its intelligence, instead of rendering it visibly, or to do both at the same time. The first of these contrivances has been found to work admirably; but the second, though sound in principle, has not been found so efficient as later inventions.

In 1840 Mr. Bain, in conjunction with Mr. Barwise, patented a clock which was to be set in motion by electricity; and in the next following year he brought forward a new electric printing telegraph. The essential principles of this telegraph are two. First, the employment of type, mounted on the periphery of a disc or wheel, capable of revolving with its edge carrying the type very near to a cylinder covered with white paper, between which and the type-wheel a piece of transferring paper or riband is placed; the cylinder has a small movement in a spiral direction communicated to it, after each impression of a signal. The second principle is that of the use of two clocks at the two communicating stations, to rotate the type-wheels with a uniform motion. These clocks, having been adjusted to exactly the same rate, and being started from the same signal, would bring continually, at each station, similar type opposite to the paper cylinders at the same moment. A hand or index revolving on a dial in front of the machine, at the same rate as the type-wheel, indicates to the operator the signals which are successively in a position ready for printing in his own instrument, and therefore, if the clocks go accurately together, in a similar position in his correspondent's instrument.

In the autumn of 1842 Mr. Bain patented his proposed plan for working an electric telepraph with a peculiar form of battery. At one end of the line he buried in moist earth a large plate of zinc, and at the other end a plate of copper, iron,

or other substance, such as coke or charcoal, which might act the part of a negative plate to the zinc. Then on connecting these distant plates with a wire insulated from the earth, a current of electricity would constantly pass from the one plate to the other. This system has been found insufficient at long distances.

In 1843 Mr. Cooke specified his patent for the mode of insulating the wires by suspending them in the air upon posts or standards of wood or iron; the wires not coming in actual contact with any part of the standard, but passing through rings of porcelain or earthenware. The standards are usually fixed at from forty to sixty yards asunder, and at each quarter of a mile a stouter post is placed, to bear the winding or straining apparatus. The intermediate posts within each quarter of a mile merely supported the wire, without reference to its tension, which depended solely on the winding posts. Instead of the copper wires hitherto employed, iron wires of a larger size were then used. Before this period the wires had been placed in iron tubes buried beneath the ground; but this new form of arrangement was deemed an improvement, and has since been generally acted on in this country.

Since the year last named, the progress of the electro-telegraphic system has been exceedingly rapid. In 1846 an Electric Telegraph Company was formed, by whom the patent rights of Messrs. Cooke and Wheatstone, and some of those of Mr. Bain, were purchased. It is this company which has carried out the greatest part of what has been recently effected in Great Britain. Nearly all the principal railways, except the Great Western, have had lines of telegraphic wire laid by it. A modification of Cooke and Wheatstone's arrangements is generally employed; but the company also possesses a remarkable printing or rather registering telegraph invented by Mr. Bain. A long strip of paper has small holes stamped in it by means of a machine, each hole or group of holes representing a particular letter. This paper is coiled on a wooden roller, from whence it passes to a metal roller, where metallic points act upon it. The arrangement of the mechanism is such, that when the metallic points touch the metal of the roller, through the holes in the paper, a galvanic circuit is completed; but when the points touch the paper itself, the circuit is stopped; and this rapid alternation is made to indicate signals. There is also a recipient apparatus, in which the strip of paper employed has been first soaked in diluted sulphuric acid, and then in a solution of prussiate of potash. Two metallic points press on this paper; and when a galvanic current is passing through these points, they discolour the chemically-prepared paper, and leave a number of dark spots upon it; but when no current is passing, no discolouration is produced. By an ingenious arrangement of mechanism, the recipient apparatus at the end of the telegraphic wire marks with its dark spots the signals which are conveyed by the transmitting apparatus at the other end.

In the form which the English telegraphic system has now assumed, all the stations are placed in connection with the central office in Lothbury. At this office are departments for transmitting messages to and receiving messages from almost all parts of the kingdom. There are several rooms, each of which has its own electric clock, showing Greenwich time, and its own electro-telegraphic machine. Wires pass from the machines to the great hall, and from the hall to the outside of the building, whence they pass under the pavement of the London streets to the four great railway stations at Euston Square, Shoreditch, London Bridge, and Waterloo Road, as well as to the Admiralty and one or two other metropolitan stations. Along the lines of railway the telegraphic wires and apparatus are so arranged as to be available both for the railway company's own purposes, and for commercial purposes in general; and a system has been formed whereby information of a commercial character is regularly transmitted to and from the great centres of industry and commerce.

Mr. Whishaw, in a paper communicated to the British Association in 1849, gave an account of the telegraphic systems followed in three countries, Great Britain, Prussia, and the United States. In Great Britain the wires are suspended on poles. The length of railway to which the system had been applied down to July, 1849, was about 2000 miles; and the cost was about 150*l.* per mile. In Prussia the telegraphic wires were suspended on the English system until the year 1844, since which date a new plan has been followed. The wires are coated with gutta-percha, and laid along under ground, at a distance of about two feet beneath the surface, not only under railways, but under turnpike roads and towing paths. There are at each principal station two telegraphic machines, one colloquial and one printing. The length of Prussian telegraph, to July, 1849, was about 1500 miles, at a cost of about 40*l.* per mile. In the United States the telegraphic line is formed by a single iron wire supported from post to post. It is carried not only along railways, but across the open country. There were in July, 1849, about 10,500 miles of American telegraph, at a cost of about 20*l.* per mile.

Various improvements in electro-telegraphic machines have been patented from time to time by Messrs. Brett and Little, and other inventors; but those which seem most likely to be attended with important results relate to Submarine Telegraphs. It has been proved that wires may be so coated with gutta-percha and other materials as to act under water. A tube so constructed has been carried under the sea between Dover and Calais; and the first communication by electric telegraph was made from Cape Grinez to Dover on Aug. 28, 1850. The length from Dover to Cape Grinez is 21 miles. The copper wire is $\frac{1}{16}$ of an inch in thickness, and is enclosed in a solid cylinder of gutta-percha $\frac{1}{2}$ of an inch in diameter. The entire length of wire is 25 miles, and its weight is 1 ton 2 cwts. 1 quarter 10$\frac{1}{2}$ lbs. The weight of the gutta-percha is 4 tons 7 cwts. 1 quarter 9 lbs.

TELEMANN, GEORG PHILIPP, born at Magdeburg in 1681, was a musical professor. He successively held many appointments in Ger-

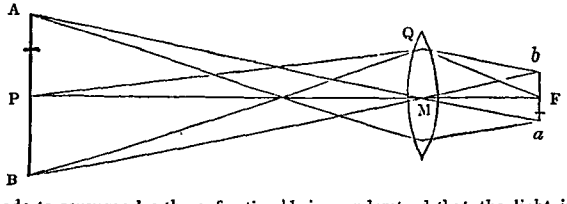
many, the chief of which was that of composer to the Lyric Theatre at Hamburg, for which he produced no less than thirty-five operas. But these were only a small part of his labours: he is said to have exceeded the prolific Alessandro Scarlatti in the number of his works for the church and the chamber. He was a fellow-student of Handel, and died in 1767, at the age of 86.

TELEOSAURUS, a family of extinct crocodilians characterised by a combination of a bi-concave structure of the vertebræ with long narrow jaws armed with slender, conical, sharp-pointed, and equal teeth, adapted, like those of the existing Gavials, for the seizure and destruction of fishes. Professor Owen makes this family consist of two genera, whose characters mainly rest on the difference of position in the external nostril. In the first of these, *Teleosaurus*, the external nostril is terminal and placed at the extremity of the upper jaw; in the other, *Steneosaurus*, this aperture is a little behind and above the termination of the upper jaw. The *Teleosauri* and *Steneosauri* are confined to the oolitic division of the secondary rocks.

TELESCOPE (from the Greek τηλεσκόπος, 'far-seeing'), an optical instrument consisting of a tube which contains a system of glass lenses having all their centres in one common axis, or a tube containing a metallic speculum in combination with such lenses. Such telescopes as are constructed with glass lenses only are called dioptric, or refracting telescopes; and the others catoptric, or reflecting telescopes. By these instruments objects even in the remotest depths of space are rendered accessible to human vision; and terrestrial objects faintly visible in the distance are brought as it were close to the eye. In the hands of astronomers they were the means, almost immediately on being invented, of making important discoveries in the heavens, and they form a valuable addition to the instruments employed by the mariner and the surveyor.

There is evidence to show that Roger Bacon, who died in 1292, knew that lenses might be so combined as to make objects seen through them appear to be magnified. No further indications of telescopes are met with till after the middle of the 16th century, when Dr. Dee, in his preface to Euclid's 'Elements' (1570), suggests that the commander of an army, who wants to discover the number and arrangement of an enemy's troops, 'may wonderfully help himself by perspective glasses.' In 1609 Galileo constructed a telescope, with which he discovered the four satellites of the planet Jupiter. [Galilei, vi., 472]. Huygens, Dr. James Gregory, Sir Isaac Newton, Dr. Hooke, Dr. Bradley, Sir Wm. Herschel, Mr. Dollond, and Lord Rosse, have since been the persons most distinguished for the improvements which they have respectively made in the construction of telescopes.

In exhibiting the principles on which a telescope is constructed, it is proper to observe that if the lens be of the kind called convex, the rays in the pencils of light which proceed from every part of an object, as APB, in passing through the lens, supposing the latter to have a proper degree of



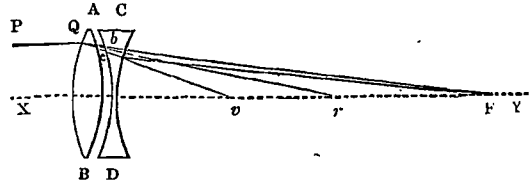
curvature, are made to converge by the refracting power of the glass at points, as *a*, F, and *b*, and the assemblage of such points constitutes an image of the object: if a screen were placed at F perpendicularly to the axis PF, the object would be represented on it, in an inverted position. If the lens were of a concave form, the rays in the several pencils, after passing through it, would be made to diverge from one another, and consequently no image could be formed.

If the rays in the pencils of light proceeding from different points in an object are reflected from the surface of a concave mirror, supposing the latter to have a certain degree of curvature, those rays will unite in as many points, and form an image of the object. If a screen were placed where the image is formed, the object would be represented on it, in an inverted position. The rays in each pencil reflected from the surface of a convex mirror are made to diverge from each other; and in that case no image is formed.

In the article Lens there will be found a collection of formulæ for the reciprocals of the focal lengths of lenses of all the different kinds; it being understood that the light is homogeneous. But since all light is not of one kind, and a lens acts like a prism in causing, in each pencil, the rays of the differently coloured light to diverge from one another: it follows that the representation of an object when formed by a single lens is indistinct and surrounded by a coloured fringe. [Light.] It may be observed that the principal focus of any lens, with respect to each colour, may be obtained from the formulæ in Lens by substituting in them the value of μ (the index of refraction) for the given kind of light.

Since different kinds of glass have different degrees of dispersive power, it is evident that the chromatic aberration may be diminished, if not wholly removed, by causing the light to pass through two lenses of different kinds of glass, and of such forms that they may refract the rays in each pencil in opposite directions. The object-glass of a telescope when so formed is said to be *achromatic*, and the manner in which the effect is produced may be understood from the following description. Let PQ be the direction of a pencil of compound light incident on the first surface of

the convex lens AB, in a direction parallel to the common axis, XY, of the two lenses. By the refractive power of this lens (crown glass) the red rays in the pencil would, if no object were interposed, proceed in the direction Qb, meeting XY in r, and the violet ray in the pencil would proceed



in the direction Qc, meeting the axis in v. But the refractive power of the concave lens CD (flint glass) acts, from its form, in a direction contrary to that of the convex lens, causing the rays either to diverge from the axis XY, or to meet it in points beyond v and r, towards Y: suppose the curvature of this lens to be such that the red rays in the pencil PQ would, after refraction in both lenses, meet the axis in F (the ray Qbr taking the direction bF); then the dispersive power of this kind of glass exceeding that of the other kind, the violet rays in the refracted pencil will tend farther away from the axis than the red rays do, and thus will tend towards the latter; the ray Qcv, for example, taking the direction cF. It is conceivable therefore that the curvatures of the surfaces of the lenses may be such that, in each incident pencil, the red and violet rays (the extreme rays of the spectrum) shall after refraction unite at the place of the image; and thus the fringe due to these two colours may be destroyed.

If the two kinds of glass dispersed the different colour-making rays in the same proportions, their contrary refractions would cause all the colours to be united on the image formed at F: no two kinds of glass have however been as yet discovered which possess this property; and therefore the images formed by the red and violet rays (the extreme rays of the spectrum) only are united: fortunately in uniting these the others are brought so near together, that for ordinary purposes the image is as free from colour as can be desired.

In an achromatic telescope the focal lengths of the compound lens for red and violet rays are to be equal to one another; and it is evident that this condition will be fulfilled when $\frac{\delta\mu}{R} - \frac{\delta\mu'}{R'} = 0$, in which R is the radius of each surface of a double convex lens of crown glass, and R′ the radius of each surface of a double concave lens of flint glass; $\delta\mu$ and $\delta\mu'$ are the differences of the indexes of refraction for red and violet rays respectively. From this equation we have R : R′ :: $\delta\mu$: $\delta\mu'$; then, dividing the antecedents by $\mu-1$ and the consequents by $\mu'-1$, we have [Optics] the ratio of the focal lengths of the two lenses equal to that of the dispersive powers of the two kinds of glass; and hence, the focal length of the compound lens being assumed at pleasure, those of the separate lenses, consequently the radii of their surfaces, may be obtained.

Though on uniting the red and violet light by lenses of crown and flint glass the chromatic dispersion is in a great measure corrected, yet when the image is examined, it is found to be surrounded by a green-coloured fringe. The difficulty of procuring flint glass of sufficient purity is also a serious impediment to the perfection of achromatic lenses for telescopes; and though great rewards have been offered for glass which shall be free from defects, the exertions of artists have hitherto been almost without success. Occasionally however flint glass is obtained nearly homogeneous, and the opticians of Germany appear, in this respect, to have been more fortunate than those of England.

The late Dr. Ritchie obtained a disc of flint glass which was formed by Mr. Dollond into an object-glass nearly 7¼ inches in diameter. It was applied to a telescope 12 feet long, and bore a magnifying power equal to 700 times: it is said to have had scarcely any spherical aberration, and to have been very free from colour.

The image formed by the great speculum of a reflecting telescope is free from the inconveniences attending the chromatic aberration of light. If the surface of the speculum were that which is formed by the revolution of a parabola about its axis, then all the rays in any pencil proceeding from a very remote object, as one of the celestial bodies, and being incident on the speculum in a direction parallel to the axis, would, by the nature of the parabola, converge accurately in the focus of the curve; and on this account, an effort is always made to give to the reflecting surface of the speculum a paraboloidal figure. The advantage does not however hold good with the pencils which fall on the mirror in directions oblique to the axis.

The telescope invented by Galileo consisted of one convex lens and one concave lens; the distance between them being equal to the difference between the focal lengths of the two lenses. In this instrument, if the object were so remote that the rays in each pencil of light might be considered as parallel to one another, there would be formed at the principal focus of the convex lens an inverted image of that object; then the concave lens being placed between the former lens and that image, in such a situation that its principal focus may coincide with the place of that image, the rays in each pencil will, by the refracting power of the lens, be made to emerge parallel to one another; and in this case, by the optical properties of the eye, distinct vision is obtained.

This is the construction of what is called an *Opera Glass*; and the Galilean telescope is now used chiefly for viewing objects within a theatre, or an apartment, since if considerable magnifying

power were given to it the extent of the field of view would be very small.

A simple telescope may also be constructed by means of two convex lenses, which are placed at a distance from one another equal to the sum of their focal lengths. For the image being formed at the focus of the lens which is nearest to the object, as in the Galilean telescope, and being supposed to be a plane surface, the light also being supposed to be homogeneous, the rays of each pencil, after crossing at the focus and proceeding from thence in a divergent state, on being allowed to fall upon the surface of the second lens, may be refracted in the latter so as to pass out from thence in parallel directions; and consequently distinct vision of the object, in an inverted position, may be obtained by an eye situated so as to receive the pencils.

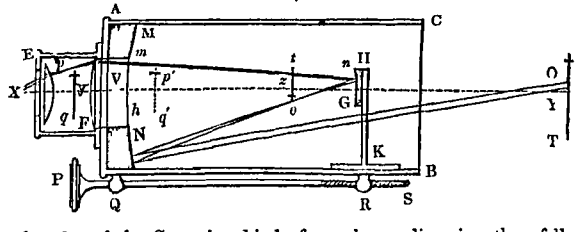
The spherical aberration produced by the eye-glass can only be diminished by diminishing the inclination at which the rays in the marginal pencils fall upon the surface of the lens after having crossed at the focus of the object-glass; that is, by using a lens of less convexity or of greater focal length, adding a second eye-glass in order finally to render the rays in each pencil parallel to one another. This is called the Huygenian eye-piece, and it is generally used for astronomical telescopes: the object seen through it is inverted, as in the last-mentioned telescope.

In order to afford a view of objects in the same position as they appear to have when seen by the naked eye, Mr. Dollond employed an eye-tube containing four lenses so placed that both the spherical and the chromatic aberrations are corrected perhaps as far as the correction is possible. This is accomplished by placing a first eye-glass beyond the image formed by the object-glass, and at a distance from it less than the focal length of that eye-glass; by this disposition the rays of mean refrangibility in each pencil which diverges from the image go on with diminished divergency. A little way beyond the place where the axes of the oblique pencils cross the axis of the telescope there is placed the second eye-glass, which is of such focal length that the mean refrangible rays in each pencil, after passing through it, meet in a point, and thus a second image of the object is formed near the eye. But the several pencils of rays are intercepted by the third eye-glass (commonly called the field-glass), and the second image is thereby formed rather nearer to the first than it would be without such field-lens: from this image the rays in each pencil diverge, and by the refractive power of the fourth eye-glass they are made to enter the eye in parallel directions: thus distinct vision of the external object is obtained.

Now, in each pencil, the red and violet rays which had been united at the image formed by the object-glass, and which there crossed each other, go on from thence diverging from each other till, on the opposite side of the axis of the telescope, they fall upon the surface of the second eye-glass: after passing through this lens, the violet ray, which is always more refracted than the red ray, gradually converges towards the latter, and at length meets it in some place short of that at which the rays of mean refraction unite to form the second image. The practice is to fix the third or field-glass exactly or nearly at the place where the red and violet rays so unite in all the pencils; for the different coloured rays crossing each other in that place, they are finally, by the refractive power of the fourth eye-glass, made to enter the eye in parallel directions, and thus afford a view of the object nearly or wholly free from colour.

In reflecting telescopes, a speculum at one extremity of the tube serves the purpose of the object-glass in refracting telescopes by forming an image at its focus; and the manner in which, in reflecting telescopes, the image is transmitted to the eye remains now to be shown.

The following diagram represents a longitudinal section through the axis XY of the instrument,



which is supposed to be of the Gregorian kind. AB is the tube which contains the specula, and is open at the end CB; and at the extremity nearest to the eye of the observer is a tube EF, containing two lenses. MN is the anterior surface of the great speculum, which has a circular perforation, *mh*, at its centre: G is a small speculum, concave like the former, its surface being either spherical or parabolical. It is connected with the side of the tube AB by the arm HK, and is capable of being moved in the direction of the axis XY by means of the rod PS. The course of a pencil of light from an object OT appears in the cut. After reflexion from MN the rays form an image *ot*, and from thence diverging they fall on the concave mirror G; being again reflected they pass through the aperture at V in the mirror MN, and are transmitted to the eye at X, after being refracted in the lenses at F and E, and forming an image *pq* of the object.

The Newtonian reflecting telescopes have one concave speculum at the bottom of the tube; and, in each pencil of light, the rays reflected from it fall in a convergent state upon a small plane mirror placed so as to make an angle of 45° with the axis XY of the telescope: after the second reflection the rays unite and form an image which is viewed through a Huygenian eye-piece fixed in

the side of the tube, AB, opposite the plane mirror; that is, near the open end of the tube.

The telescope constructed by the late Sir William Herschel differed from the Newtonian telescope only in having no small mirror. The surface of the great speculum, which was 4 feet in diameter, had a small obliquity to the axis XY, so that the image formed by reflection from it fell near the lower side of the tube at its open end: at this place there was a sliding apparatus which carried a tube containing the eye-glasses. The observer in viewing was situated at the open end of the tube, with his back to the object, and he looked directly towards the centre of the speculum. The reflecting telescope executed by Lord Rosse in 1842 is 56 feet long, and its speculum is 6 feet in diameter. It is capable of being directed from the zenith to the horizon towards the south, and from the zenith to a position parallel to the earth's axis towards the north; it has also a movement in azimuth of about 8 degrees on each side of the meridian.

Besides the power of magnifying objects, that of affording distinct vision with given quantities of light is often an essential requisite in a telescope, particularly to naval men, who have occasion during the obscurity of the night to keep in view a ship of which they may be in chase. This subject was investigated by Sir William Herschel, and an account of his researches on what he calls the 'space-penetrating power of telescopes' was printed in the 'Philosophical Transactions' for 1800.

TELESCO'PIUM (the Telescope), a constellation of Lacaille, in the southern hemisphere, surrounded by Ara, Pavo, Sagittarius, and Ophiuchus.

TELFORD, THOMAS, was the son of a shepherd in Eskdale, Dumfriesshire, where he was born, Aug. 9, 1757. He received the rudiments of education in the parish school of Westerkirk; and while engaged as a shepherd boy he made use of his leisure in studying the books furnished by his village friends. At the age of fourteen he was apprenticed to a stone-mason in the town of Langholm. In 1780, being then about twenty-three, he went to Edinburgh, where he seems to have devoted much attention both to architecture and drawing. After remaining there about two years, he removed to London, and obtained employment at Somerset House, then erecting by Sir William Chambers. He was employed upon various buildings at Portsmouth dockyard for three years subsequent to 1784; and in 1787 he was employed by Sir William Pulteney to make some alterations at Shrewsbury Castle. He thereupon removed to Shrewsbury, where he was also employed to erect a new gaol, and was subsequently appointed county surveyor, in which office he had to furnish plans for and oversee the construction of bridges and similar works. He erected the iron bridge over the Severn at Buildwas, besides about forty smaller bridges in the same county.

The Ellesmere Canal was the first great work upon which Telford was engaged; and from 1793, in which year the act of parliament for its construction was obtained, his attention was directed almost solely to civil engineering. In constructing the canal, he abandoned the puddling system, and formed the bed of flanged cast-iron plates resting upon walls built on piers, and formed the sides of masonry. The aqueduct-bridge over the valley of the Dee, called the Pont-y-Cysylte, is a remarkable work. It consists of a trough of cast-iron plates, securely flanged together, and supported by eighteen piers or pillars of masonry, the elevation of which is 121 feet above the water. These gigantic works were executed between 1795 and 1805. The Caledonian Canal, which was opened throughout in 1823, is another of Telford's principal works. The locks were the largest ever constructed at that time, being 40 feet wide, and from 170 to 180 feet long. Of other canals constructed wholly or partially under Telford's superintendence it is sufficient to mention the Glasgow, Paisley, and Ardrossan; the Macclesfield; the Birmingham and Liverpool Junction; the Gloucester and Berkeley (completed under his direction); the Birmingham, which was completely remodelled, and adapted to the conduct of a very extensive traffic, by him; and the Weaver navigation, in Cheshire. He also constructed a new tunnel, 2926 yards long, 16 feet high, and 14 feet wide, at Harecastle, on the Trent and Mersey Canal. He also executed many important works connected with the drainage of the fen country, especially of Bedford Level. On the Continent he superintended the construction of the Gotha Canal, in Sweden, a navigation of about 120 miles, of which 55 are artificial canal. For this work a Swedish order of knighthood and other honours were conferred upon him.

The works executed by Telford under the Commissioners of Highland Roads and Bridges were of great importance; and in the improvements of the great road from London to Holyhead, under another parliamentary commission, appointed in 1815, Telford had a further opportunity of carrying into effect his system of road-making. The Menai suspension-bridge especially is a noble example of his boldness in designing and practical skill. [MENAI STRAIT.]

Among other works of Telford are many bridges of considerable size, in which he adopted the important principle of making the spandrils hollow, and supporting the roadway upon slabs laid upon longitudinal walls, instead of filling up the haunches with a mass of loose rubbish, which often proves of serious inconvenience when the masonry of the bridge needs repair.

Telford executed some important harbour-works at Aberdeen and Dundee; but his most striking performance of this class is the St. Katherine Docks, London. [DOCK.]

In addition to the works which he executed himself, Telford was frequently applied to for his judgment upon important schemes, and in this way he made many reports to parliament. In 1838 was published the 'Life of Thomas Telford, Civil Engineer,' written by himself, 1 vol. 4to., with a companion volume in large folio, containing 83 plates; and with a preface and supplement by the editor, Mr. Rickman.

Before leaving his native district, Telford acquired some distinction as a poet. He wrote in

the homely style of Ramsay and Fergusson, and contributed small pieces to Ruddiman's 'Weekly Magazine,' under the signature of 'Eskdale Tam.' Telford by his own application acquired a competent knowledge of several languages; and he has left valuable contributions to engineering literature, in the articles 'Architecture,' 'Bridge,' 'Civil Architecture,' and 'Inland Navigation,' in Brewster's 'Edinburgh Encyclopædia.' The Russian government frequently applied to him for advice respecting the construction of roads and canals; and the Emperor Alexander acknowledged his sense of his services, in 1808, by sending him a diamond ring with a suitable inscription. Although he was not connected with the Institution of Civil Engineers at its formation, he accepted their invitation in 1820 to become their president, and bequeathed 2000*l.* to them at his death. He died Sept. 2, 1834, and was buried in Westminster Abbey.

TELL, WILLIAM, a native of the village of Bürglen near Altorf in Switzerland, who lived towards the end of the 13th and during the first half of the 14th century. When Albert I. of Austria was endeavouring to suppress the spirit of freedom and independence in the three Waldstädte, Uri, Schwyz, and Unterwalden, the principal men, in 1307, formed a league for the deliverance of their country, which was headed by Walter Fürst, Arnold von Melchthal, and Werner Stauffacher. William Tell, who had married a daughter of Walter Fürst, also belonged to the league, though without taking any prominent part in it. While the confederates were daily gaining new strength, Hermann Gessler of Brunegg, one of the bailiffs of Albert I., who had taken up his residence in the canton of Uri, after various other vexatious acts, caused the ducal hat of Austria to be raised on a pole in the market-place of Altorf, and commanded that every one who passed the pole should uncover his head. Upon this occasion is said to have occurred the somewhat apocryphal story of shooting the apple from his son's head. What is more certain is, that he was arrested by Gessler's order; but succeeded in escaping while being conveyed across the lake of Waldstädten to Gessler's castle. He then lay in wait for the bailiff, who was proceeding to Küssnacht, met him in a narrow defile, and shot him through the heart. This happened towards the end of the year 1307. After this occurrence Tell sinks again into his former obscurity, though he is said to have taken part in the battle of Morgarten, and to have perished, in 1350, in the river Schächen during a great flood.

TELLERS OF THE EXCHEQUER were the holders of an ancient office in the Exchequer. They were four in number; their duties were to receive money payable into the Exchequer on behalf of the king, to give the clerk of the pells (skins or rolls of parchment) a bill of receipt for the money; to pay all money according to the warrant of the auditor of receipts, and to make weekly and yearly books of receipts and payments for the lord treasurer. The office was abolished by act of parliament (4 & 5 Wm. IV., c. 15), together with that of the clerk of the pells and the several offices subordinate thereto, and a comptroller-general of the receipt and issue of his Majesty's Exchequer was appointed to perform the duties of the four tellers.

TELLICHERRY. [HINDUSTAN, vii., 197.]

TELLU'RIUM, a metal discovered in 1782 by Müller of Reichenstein. Its colour is silver-white, and it is very brilliant; it is crystalline and brittle, of a lamellar fracture, easily pulverised, and a worse conductor of electricity than antimony or bismuth. Its specific gravity is about 6.13. It is nearly as fusible as antimony, and at a high temperature it boils, and may be distilled. When strongly heated in contact with air, it burns with a lively blue flame, green at the borders, and forms a white vapour, which has an acid odour.

The principal ores of tellurium are *Native Tellurium*, both crystalline and massive, *Graphic* or *Auro-Argentiferous Tellurium*, *Yellow Tellurium*, *Black Tellurium*, and *Bismuthic Tellurium* or *Telluret of Bismuth*.

The chief compounds of tellurium are the following:—

Oxygen and *Tellurium* form the *Oxide of Tellurium* or *Tellurous Acid* (T^1O^1). It is a white granular anhydrous powder, insoluble in water and acids. Its salts are called *Tellurites*. The *Sesquioxide of Tellurium*, or *Telluric Acid* (T^2O^3), appears in hexagonal crystals, with slight acid properties. The crystals contain water, two-thirds of which they lose at about 212°, and the remainder below a red heat becomes a mass of a fine orange colour. *Hydrogen* and *Tellurium* produce *Telluretted Hydrogen Gas* (T^1H^1); it is soluble in water, forming a claret-coloured solution; and, as it possesses acid properties, though feebly, it has been called *Hydrotelluric Acid*. *Chlorine* and *Tellurium* form a compound—a *chloride* (T^1Chl^1), which is a white crystalline solid; and a *di-chloride* (T^2Chl^1), a violet-coloured vapour, which condenses at first into a black liquid, and eventually into a solid of the same colour. *Sulphur* and *Tellurium* form two compounds; the *sulphuret* (T^1S^1), a dark brown liquid; and the *per-sulphuret*, a deep yellow liquid.

TEMANZA, TOMMASO, the son of an architect, was born at Venice in 1705. Having finished his mathematical studies in the school of the eminent Marchese Poleni, he was appointed one of the assistants in the Commission of Engineers, and in 1742 became the chief of that body. His principal architectural works are—the church of La Maddelena at Venice, the façade of Santa Margherita at Padua, the Rotunda at Piazzolo, and the bridge over the Brenta at Dolo. It is as a writer that Temanza is chiefly known, more especially by his 'Vite de' più Eccellenti Architetti e Scultori Veneziani,' 4to., Ven., 1778. He also published the 'Antichità di Rimini,' folio, 1741; and left behind him another work, 'Degli Archi e delle Volte, e delle Regole generali dell' Architettura Civile,' which was first edited in 1811. Temanza died at Venice, June 14, 1789.

TEME. [SHROPSHIRE.]

TEMESWAR, THE BANAT OF, in Hungary, comprehending the counties of Torontal, Temes, and Krassova, is bounded N. by the

Maros, W. by the Theiss and the Danube, S. by the Danube, and E. by the Cserna (a feeder of the Marosch) and the offsets of the Carpathians. The Banat has an area of 6928 square miles, and a population of 881,600. It is remarkable for the great varieties of climate: in many parts the snow on the high mountains never melts, and in other parts it falls only in severe winters. A third part of the country is mountainous, and almost everywhere well watered. The ground which has been gained by draining the morasses on the banks of the Theiss and the Danube, and on the lower mountain slopes by clearing the forests, is extremely fruitful. In the south of the Banat is the most extensive sandy tract in the whole Austrian Empire, in which there are however many oases. On the lower mountains there are vast forests and fine pastures. The principal rivers are the Danube, Theiss, Maros, Temes, and Bega, called Karos in the lower part of its course. Of the numerous canals, cut chiefly to drain the marshes, and at the same time with a view to facilitate traffic, the principal is the Bega Canal, 75 miles in length, which traverses the whole of the counties of Temes and Torental, and is conducted into the Theiss. The imperfectly-drained land is laid out in rice fields. The wheat and maize of the Banat are of the finest quality. Successful attempts have been made to cultivate cotton and silk, and in some parts a sweet wine is produced. With the exception of the marshy districts the climate is very healthy. Mineral springs are frequent: those of Mehadia, which were known to the Romans, are much resorted to. About this place, as well as in other parts of the Banat, Roman antiquities are frequently found. The population of the Banat consists chiefly of Wallachs and Germans. In the mountainous districts, the Wallachian language is prevalent; in the towns and colonised plains, the German; and on the Servian frontier, the Servian or Illyrian. The natural productions are horses, horned cattle, swine, wheat, maize, rice, flax, hemp, tobacco, fruit, wine, woad, madder, saffron, silk, timber, honey; game of all kinds and fish abound. The minerals are gold, silver, copper, zinc, and some iron. The gold is obtained by gipsies, who wash the sand of the rivers. The chief occupations of the inhabitants are agriculture and the breeding of cattle.

The Banat, the county of BACS, with the Syrmian districts of Ruma and Illok [SLAVONIA], now form the *Woiwodeschaft of Servia and Temeswar*, of which the entire area is about 11,800 square miles, and the total population 1,467,000.

Temeswar, the capital of the Woiwodeschaft of the Banat, and of the county of Temes, is situated in 45° 45′ N. lat., 21° 10′ E. long., between the Temes and the Bega, on the Bega Canal, and has about 13,000 inhabitants, not including the garrison. It is one of the strongest fortresses, and one of the handsomest and most regular towns in the whole Austrian Empire. The inner town, or fortress, is surrounded with triple walls and moats, and consists of large uniform stone houses, in straight, broad, well-paved streets. There are three gates, the Vienna, Peterwardein, and Transylvania gates, which are defended by strong blockhouses. Temeswar is the seat of the Catholic bishop of Csanad, and of the schismatic Greek bishop of Temeswar; here too are the court of justice for the three counties, a military academy, and a great arsenal. The town is the seat of the vice-woiwode of Servia, and the place of meeting of the diet of the Woiwodeschaft. The most remarkable buildings are—the old strong castle of John Hunyady, the fine gothic cathedral of St. George, the cathedral of the schismatic Greeks, the elegant residence of the bishop of Csanad, the chapter-house, the house of the commander of the military frontier, the county hall in the great square, the barracks, the military and civil hospitals, the Racian town-hall, which contains the theatre and the assembly-rooms. Temeswar has three suburbs, one before each gate, at the distance of 300 paces, with fine avenues of trees leading to them. There is a considerable trade at Temeswar in the productions of the country, and some manufactures of cloth, paper, iron-wire, and silk. Under the walls of Temeswar took place the utter and final defeat of the Hungarian insurgents by the Austrians under Marshal Haynau, Aug. 9, 1849. *Versets*, or *Werschetz*, situated S. of Temeswar, close to the Roman entrenchments, is a large fortified town, with about 17,000 inhabitants. It is the residence of a schismatical Greek bishop, and has a gymnasium and a military school. The environs are in many parts marshy and productive of rice; silk and wine are also produced. *Neu-Arad*, a well-built fortified town, inhabited chiefly by Germans, is situated on the left bank of the Marosch, and has about 13,000 inhabitants. This town has a considerable trade in salt and in timber, which is conveyed down the Marosch from Transylvania. *Lippa*, further E. on the left bank of the Marosch, has about 5000 inhabitants.

In the county of Torontal, which lies W. of the county of Temeswar, the chief towns are—*Nagy-Beczkerek*, the capital, which stands on the Bega Canal, in a country abounding in mulberry plantations, and has about 10,000 inhabitants: *Gros-St.-Miklos*, which is N. of Nagy-Beczkerek, on the left bank of the Aranca, a feeder of the Theiss, and has 11,000 inhabitants: and *Nagy-Kikinda*, nearly midway between the two preceding, population 10,500.

The county of Krassova, which lies E. of that of Temes, is mountainous; it contains good forests; iron, silver, and copper mines and works; but has no towns of importance.

TE'MIA, Le Vaillant's name for a genus of *Insessores*, or Perching Birds, which, Cuvier observes, M. Vieillot has changed into *Crypsirina*, and Dr. Horsfield into *Phrenotrix*, whilst M. Temminck arranges them under *Glaucopis*.

Cuvier remarks, that these birds have the carriage and tail of the magpies, an elevated bill with the upper mandible convex, and the base furnished with velvety feathers, nearly as in the Birds of Paradise. The species most anciently known is, he observes, the *Corvus varians* of Latham, which is of a bronzed green colour, and

found in India and Africa. Cuvier places the genus between *Caryocatactes* and *Glaucopis*.

Examples.—*Pica vagabunda*, Gould in 'Century of Birds from the Himalayan Mountains;'

Pica vagabunda.

and *Corvus varians*, Horsfield in 'Zoological Researches in Java.'

TEMPE was the ancient name of a valley in Thessaly, lying between Mount Olympus on the north and Mount Ossa on the south, near the mouth of the river Peneus, which runs through it. It is a narrow glen, not quite five miles long, opening on the east into a wide plain which extends to the Thermaic Gulf. It forms the only break in the great chain of mountains by which Thessaly is enclosed on all sides.

TEMPERATURE. Before the difference of temperature on the same parallel of latitude in the old and new continents was known or regarded, a simple formula was thought sufficient to express the temperature at any parallel of terrestrial latitude. In 1819 M. Daubuisson ('Traité de Géognosie') proposed, for this purpose, the formula $t = 32° + 49° \cos.^2 L$, in which t denotes the mean temperature (Fahrenheit) at the place, and L its geographical latitude; the mean temperature at the equator being considered as 81°. This formula has been found to serve for temperatures in Europe as far north as the latitude of 60°; but beyond that parallel it is useless, and it supposes the temperature at the geographical pole to be 32°, which is much too high.

From above 4000 observations which were made by Sir Edward Parry, it is found that in Winter Harbour, in 74° 45′ N. lat., and in long. 250° (110° W. long.), the mean temperature is as low as 1.33°; and from above 600 observations at Spitzbergen (78° N. lat.) Mr. Scoresby found the mean temperature to be 16.99°. A mean temperature of 17° is also found on the American continent in 65° N. lat.; and hence it may be inferred that, between the parallels of 65° and 78°, and near the meridian of Winter Island, there exists a pole of minimum temperature. The mean temperatures of places in the eastern parts of Asia have not been well ascertained; but since at North Cape in Lapland the mean temperature is that of freezing water, and in Siberia, as low as the parallel of 60° N. lat., the surface of the ground is constantly frozen, it is evident that the isothermal line of 32° must form a curve about some point as a focus in the northern part of the Asiatic continent.

This circumstance has suggested to Sir David Brewster the formula $t = (T - \tau) \sin.^n \delta \sin.^n \delta' + \tau$ for the mean temperature at any place: t being that temperature, T the mean temperature at the equator, τ the temperature at each of the foci of coldness, and δ δ', the distances in degrees between the given place and those foci. A corresponding expression will serve to determine the number of vibrations which would be performed by a magnetised needle in a given time if T and τ be made to represent the numbers performed, in an equal time, at the magnetic equator and at either of the poles of magnetic intensity: the exponent n, both for temperature and intensity, is to be determined by means of observations, and Brewster considers that the fraction $\frac{3}{4}$ may be the value of it in the formula for temperature.

It is generally believed that the temperature of the western parts of Europe is now higher than it was nearly two thousand years since; and it has hence been inferred that the poles of minimum temperature perform revolutions about the geographical pole of the earth, so that the terrestrial meridian on which the greatest cold prevails gradually changes its position.

TEMPERING. [STEEL.]

TEMPESTA, ANTONIO, was born at Florence in 1555. He studied for some years under John Strada, or Stradanus, a Fleming, and then visited Rome, where he was employed by Gregory XIII. In the Vatican he painted the Translation of the Body of St. Gregory of Nazianzus, and some other subjects, which acquired him a great reputation. He executed several good works for the Cardinal Alessandro Farnese, at his villa at Caprarola, and some at Bassano for the Marquess Giustiniani. Tempesta resided chiefly at Rome, and died there in 1630. His reputation rests now almost entirely upon his etchings. Horses were his favourite subjects, and he excelled in battles, processions, cavalcades, hunts, and various field-sports. There is a long list of the works of Tempesta in Heineken's 'Dictionnaire des Artistes,' &c., and in the 'Peintre Graveur' of Bartsch.

TEMPESTA, CAVALIERE, called also in Italy Pietro Mulier or de Mulieribus. He was a native of Holland, and his real name was Peter Molyn. He was born in 1637. He was called Tempesta from his skill in painting sea-storms, in which he in some respects rivalled Backhuyzen: he was also nearly equally excellent as an animal painter. After painting with great success in various cities of the Netherlands, he became a convert to Popery, and visited Rome. Here he found a patron in the Duke Bracciano, and

received so many orders for pictures that he was obliged to employ assistants; and the sister of one of these became his wife. Growing tired of the lady however, he left her, went to Milan, and thence to Genoa, where becoming enamoured of another he caused his wife to be murdered by a hired assassin. Tempesta was arrested, convicted, and condemned to death. The sentence was however not carried into execution. He was in prison for some years, and how he became released is uncertain. He was however busily employed with his pencil during the whole time, and he found it difficult to satisfy the demand for his pictures. On recovering his liberty he went to Milan, and there established himself, where his success was even greater than it had been previously. Here he lived a life of luxury and depravity. He died in 1701. His pictures are numerous in the north of Italy.

TEMPLARS, or KNIGHTS TEMPLARS, are the popular designations for the Brethren of the Temple at Jerusalem, also called the Soldiery of the Temple (Militia Templi) and the Soldiers of Christ. The three great religious military orders, the Knights of the Hospital of St. John of Jerusalem (commonly called the Knights Hospitallers), the Templars, and the Teutonic Knights of St. Mary of Jerusalem (or German Knights of the Cross), all originated in the 12th century; the two former towards its commencement, during the first crusade, the last not till near its close. The founders of the Order of the Templars, which is held to date from the year 1118 or 1119, were nine knights, all French. Their original vow was simply to maintain free passage for the pilgrims who should visit the Holy Land; the name which they took, and by which they were commonly known, was the Pauper Soldiers (*Pauperes Commilitones*) of the Holy City; and they professed to have no source of subsistence but the alms of the faithful. The King of Jerusalem, Baldwin II., gave them their first place of residence, a part of his palace; to which the abbot and canons of the church and convent of the Temple, which stood adjoining, added another building for keeping their arms, whence they acquired the name of *Templars*.

The new principle of their association immediately drew general attention; so much so that in 1120 the Hospitallers got their order remodelled by Pope Calixtus II. on the same principle. The first regular embodying of the Templars was by Honorius II., the successor of Calixtus, who in 1128 confirmed a rule for them, and at the same time, to distinguish them from the Hospitallers, who were arrayed in a black mantle, assigned the brethren of the new order a white mantle for their peculiar dress, which they wore plain till Eugenius III., in 1146, appointed them to wear a red cross on the left breast, in imitation of the white cross worn by the Hospitallers. This red cross was also borne upon their banner, which was formed of cloth striped black and white; whence it was called *Bauseant*, an old French term applied to a horse marked with these colours. This word consequently became the famous war-cry of the Templar chivalry.

The new order speedily rose into consideration. Members of the noblest families in every nation of Christendom eagerly sought to be joined to it; legacies and donations in lands and money were showered upon it by persons of all ranks; and in course of time it acquired ample possessions in nearly every country of Europe. At the head of the order was the Master, or Grand-Master (*Magister*, or *Magnus Magister*), who was however not only elected by the Chapter, or general body of the knights, but very much controlled by that body: the Grand-Master had immediately under him his Seneschal, or lieutenant; and other high officers were the Marshal, the Treasurer, &c. The several countries in Asia and Europe in which the order had possessions were denominated Provinces; and each of them was presided over by a resident chief, called indifferently a Grand Prior, Grand Preceptor, or Provincial Master. Under the provincial masters were the Priors, otherwise called Bailiffs, or Masters, who had charge each of one of the districts into which the province was divided; and finally under the priors were the Preceptors, each of whom presided over a single house of the order (or sometimes over two or three adjoining houses which were considered as one establishment), hence called a Preceptory. The head province was that of Jerusalem; and in this province the Grand-Master resided so long as the Christians retained any footing in the country: first in the city of Jerusalem, from the origin of the order till 1187, when Jerusalem was taken by Saladin, and the kingdom founded by Godfrey of Bouillon put an end to; then (after a retirement of four years to Antioch) at Acre, from 1191 till 1217; then at the newly-built fortress of the Pilgrims' Castle, situated on the sea-coast a few miles north of Cæsarea, till the fall of Acre, and the final extinction of the Latin power in Palestine in 1192. On this the Knights took refuge in the town of Limisso (otherwise called Limasol) in Cyprus. The other provinces in the east were Tripolis and Antioch; to which Cyprus, till then included in one of these, was added after that island became the head-quarters of the order. The western provinces were Portugal, Castile and Leon, Aragon, France and Auvergne, Normandy, Aquitaine or Poitou, Provence, England (in which Scotland and Ireland were included), Germany, Upper and Central Italy, Apulia, and Sicily.

The history of the Knights Templars would embrace the history of the wars of the Christians against the Infidels in the East for all the time they lasted after the establishment of the order. For more than 170 years the soldiers of the Temple formed the most renowned portion of the Christian troops, and almost every encounter with the enemy bore testimony to their prowess and daring.

The destroyer of the Templars was the resolute and vindictive Philip IV., of France, surnamed Le Bel. In 1306 Jacques de Molay, the Master of the Temple, was drawn to Europe by a summons from the Pope, who professed a desire to consult with him on the expediency of a union of the two orders of the Templars and the Hospitallers. The following year, while Molay was at Paris,

the first distinct accusations against the Templars were made by two individuals lying in prison under sentence of death, one of whom had formerly been a member of the order and prior of Montfaucon, but had been ejected for heresy and other offences, and the other was a person of the worst character. They made their revelations to Philip himself, and were immediately liberated from prison. Their charges imputed to the order the systematic practice and encouragement of all sorts of secret immoralities, as well as the strangest confusion of heresy, idolatry, and infidelity, far too absurd for belief. On Sept. 12, 1307, royal letters were issued sealed to all the governors of towns and other officers of the crown in authority throughout the kingdom, and the result was that the next day nearly all the Templars in France, De Molay included, were in custody. Their houses and goods were also everywhere seized; the vast stronghold of the Temple at Paris, the chief seat of the order in that kingdom, was entered and taken possession of by Philip himself; and on the following day, the 15th, the university met there, and examined De Molay and some other knights.

An act of accusation was forthwith published; and Philip at the same time wrote to the Pope, and also to the King of England, intimating what he had done, and calling upon them to second him. Edward II. expressed himself at first disinclined to believe what was said against the knights; but on soon after receiving letters from Clement, he yielded, and the English Templars were also all seized and thrown into confinement about the end of December. Fresh accusations were made, the examinations were continued under commissions, and many of the Templars were burnt at the stake. On March 18, 1314, Molay, the Grand-Master, and Guy, Grand Prior of Normandy, who had all this while remained in prison at Paris, were brought before the Archbishop of Sens, condemned to death, and burned on one of the small islands in the Seine, about the spot where the statue of Henri IV. is now erected on the Pont Neuf.

The King of France seized the moveable property of the Templars in that country; but there, and also in England, and throughout the rest of Europe, with the exception of Spain and Portugal, it was found necessary to transfer their landed possessions to the Hospitallers, or Knights of St. John (at this time commonly known as the Knights of Rhodes). In Spain the lands of the Templars were bestowed upon the Knights of Our Lady of Montesa, a new order, founded in 1317; and in Portugal the society merely took the new name of the Order of Christ.

The original residence of the Templars in London was on the south side of Holborn, near the present Southampton Buildings, whence they removed in 1185 to their new house at the western extremity of Fleet Street, the site of which still retains the name of the Temple. This was the chief seat of the order in England.

TEMPLE (the Latin 'Templum'). What is known of the architecture of the nations of antiquity is derived chiefly from their temples, a description of which is given in the articles CIVIL ARCHITECTURE and EGYPTIAN ARCHITECTURE. For further accounts of the architecture of temples and churches the articles mentioned under the head STYLES OF ARCHITECTURE may be consulted.

TEMPLE, SIR WILLIAM, was born at Blackfriars, in London, in 1628, and was the eldest son of Sir John Temple, Master of the Rolls in Ireland. He was sent to Emmanuel College, Cambridge, where the celebrated Cudworth was his tutor. He left the university in two years without a degree. When about twenty years old, he went abroad, and after two years stay returned to England, skilled in the French and Spanish languages. Before he started on his travels, he met in the Isle of Wight the young lady to whom, after many delays and difficulties, he was married in 1654.

Temple was trained to no profession. At his father's residence in Ireland he passed five years, which were divided between literary pursuits and county business, and which were marked by the birth and death of five children. In 1660 he was chosen member of the Irish convention of that year for the county of Carlow. After the Restoration he was re-elected to the Irish parliament for the same county, with his father for his colleague, and a younger brother was member for the borough of Carlow. On the prorogation of the parliament in 1663 Temple went to reside in England. The Duke of Ormond recommended him to Lord Arlington, and in 1665 Temple was sent on a secret mission to the Bishop of Münster. Though the object of the mission failed, his employer was so satisfied with the way in which he had acquitted himself that he was appointed in the same year resident at the vice-regal court of Spain at Brussels.

At the close of 1667 Temple received orders to repair to the Hague to negociate a treaty against France, and for the protection of the Spanish Netherlands from that power; where by his energy, judgment, and address the celebrated Triple Alliance was concluded Jan. 23, 1668. He was next appointed ambassador at Aix, and on the conclusion of the peace he was sent as ambassador to the Hague. Here he continued, carrying out the policy of the Triple Alliance, till Sept., 1670, when the celebrated secret treaty having been made with France, Temple was ordered home, and in 1671 was dismissed. He now retired to Sheen, and devoted himself to gardening, the improvement of his house, and to literature. He published several works: among them, 'Observations upon the United Provinces,' 1672. Temple was summoned however from his literary retirement in 1674, to conclude the second Dutch war, and was on the point of starting for the Hague, when the Spanish ambassador in London received full power to negociate there, and in three days the treaty of Westminster was concluded. Temple was now offered the embassy to Spain, which he refused. He was soon after appointed again to the Hague, as ambassador extraordinary, and the next year ambassador to the congress at Nimeguen. The peace of Nimeguen, concluded in 1679, ill carried

out Temple's views, and he was glad to avail himself of a point of form for the purpose of withholding his signature to the treaty.

Temple now returned to England to receive an offer of the post of secretary of state, which he refused. He was much consulted by the king, who had just lost the services of Lord Danby; but here may be said to end his political career. After the Revolution of 1688 he refused office from William III. But his son, with his permission, accepted the place of secretary at war, and within a week after committed suicide.

The remainder of Temple's life was passed in the country, where he composed his 'Memoirs.' He died Jan. 27, 1699.

There are two or three biographies of Temple; one by Abel Boyer, published about fourteen years after his death, and another by his sister, Lady Giffard, prefixed to the edition of his works published in 1731, 2 vols. folio. A life has also been published by the late Mr. Peregrine Courtenay. The best edition of Temple's works is that published in 1814, in 4 vols. 8vo.

s TENACITY (from the Latin 'tenacitas,' 'the power of holding'), a property of material bodies by which their parts resist an effort to force them asunder.

This property is a result of the corpuscular forces, attractions and repulsions, acting within the insensible spaces supposed to exist between the particles of bodies: it is consequently different in different materials, and in the same material it varies with the state of the body with respect to temperature and other circumstances.

The molecules of liquids adhere to one another, and generally to those of solid bodies, by attractive forces which decrease very rapidly; and, at insensible distances from the supposed places of contact, the adhesion entirely disappears. It is on account of the small distance to which the attractions of the fluid molecules extend, and to the freedom with which the particles move on one another, that fluids appear to have so little tenacity; but from the weight which it supports in glass tubes, Dr. Robison has estimated that the mutual attractions of the particles of water on a surface equal to one square inch must far exceed 190 lbs.

The tenacity of solids constitutes, in part, the subject of the power of bodies to resist strains; and under MATERIALS, STRENGTH OF, will be found a table of the weights which would overcome the force of cohesion in rods immoveably fixed at one end and pulled in the direction of their length: those weights may be considered as the measures of tenacity in the different kinds of material.

Though, when a piece of metal is fractured, the parts will not by simple adjunction adhere together; yet, in some cases, by hammering them upon one another, so many points on their surfaces may be brought within the limits to which the force of cohesion extends, that they will acquire a tenacity equal to that which the metal had in its natural state.

The tenacity of wood is much greater in the direction of the length of its fibres than in the transverse direction, the fibres being united by a substance having little cohesive power. With respect to metals, the processes of forging and wire-drawing increase their tenacity in the longitudinal direction; the augmentation of friction and lateral cohesion, arising from the particles being forced together in the transverse direction, more than compensates for the diminution of the attraction which may result from the particles being forced or drawn farther asunder longitudinally. Copper and iron have their tenacity more than doubled, while gold, silver, brass, and lead have it more than tripled by those metals being drawn into wire.

TENAILLE, in Fortification, is a rampart raised in the main ditch, immediately in front of the curtain between two bastions; and, in its most simple form, it consists of two faces coinciding in direction with the faces of the bastions, and consequently forming with each other a re-entering angle. Generally however it consists of three faces, of which two have the directions just mentioned and the third forms a curtain which is parallel to that of the enceinte. [See P, FORTIFICATION.]

This work was originally proposed by Vauban, in order to serve the purpose, in part, of a fausse-braye, since the fires of musketry on its faces may be employed, in conjunction with those of artillery and musketry on the flanks of the bastions, to oppose the passage of the enemy across the main ditch when about to mount a breach in the ramparts of the place.

The relief of the tenaille, or the elevation of its crest above the bottom of the ditch, is determined consistently with the intention of thus defending the main ditch; and in order that the defenders of the tenaille may not be injured by the shot fired over their heads.

Besides affording additional fires for the defence of the main ditch, the tenaille serves to cover, in part, the revetment of the curtain in its rear, and prevent it from being breached by fire from any lodgments of the enemy on the glacis. Its parapet serves also to mask the postern in the curtain of the enceinte, which would otherwise be so much exposed to the fires from the counter-batteries, that the defenders might be unable to communicate through it with the outworks.

The tenaille has been considerably improved by Bousmard, who has given flanks to the work in order that the main ditch may be directly defended by them. These flanks are raised high enough to cover the revetments of the flanks of the bastions, while their upper surfaces may be grazed by a fire of artillery from thence; and, instead of being formed with open terrepleins, and parapets for musketry, as usual, each flank of the tenaille is provided with casemates, or vaults, for four pieces of artillery which are placed nearly on a level with the terreplein of the covered-way.

TENAILLON, or Great Tenaille, in Fortification, is a species of exterior work which has been occasionally constructed before the faces of a small ravelin, with a view of increasing the strength of the latter, procuring additional space beyond the ditch, or covering the shoulders of the bastions. It was invented by Vauban, who however very seldom constructed such works; and

subsequent engineers have generally considered them as inferior in defensive qualities to counter-guards placed over the faces and salient angles of the ravelins.

TENANCY IN COMMON. [COMMON, TENANCY IN.]

TENANT. Tenants, in the more extended legal sense of the word, are of various kinds, distinguished from each other by the nature of their estates; such as tenants in Fee Simple, in Fee Tail, for Life, for Years, at Will, and at Sufferance. [ESTATE; TENURE.]

TENANT AND LANDLORD. The word tenant, in the more limited legal sense, which is also the popular sense, is one who holds land under another, to whom he is bound to pay rent, and who is called his landlord. The word Land means not only land itself, but also all things, such as buildings, houses, woods, and water, which are upon it. Any one who has an absolute estate in land, provided he is also in possession, may let the land. Where the letting takes place by a contract between the parties, the contract is called a Lease, the nature of which is explained generally under LEASE. A recent act (13 & 14 Vict., c. 97, 1850) has greatly diminished the stamp duty on all written leases, and every tenant and landlord may now have a written lease by deed, for any period, at a very slight cost, so far at least as the cost of the stamp is concerned. If one man with the consent of another occupies his land, a contract of letting is assumed to have been made between them, and the occupier becomes tenant to the owner. Such tenants are considered to be upon the same footing as if the lands had been let to them for a year from the commencement of their occupation. At the end of the first year a second year's tenancy begins, unless six months' notice of the intention to determine the contract has been given by either party to the other, and so on from year to year. The same rule of law applies to cases where a tenant continues to occupy land after the expiration of a lease made by deed; but in this case all the covenants of the expired lease as to payment of rent, repairs, insurance, and the like, are in force, unless the lease is cancelled by destroying the seal; and even if there should be a verbal agreement for a different rent, still the old covenants subsist, unless the lease is cancelled. [DEED.]

Besides tenancies for fixed periods, a tenancy may exist at Will and by Sufferance. [ESTATE.] The law as to landlord and tenant generally applies, so far as it is not restricted or varied by contract between the parties, and so far as the circumstances render it applicable to the case of the letters and occupiers of lodgings.

In every case where the relation of landlord and tenant exists, certain terms are implied in the relation itself, if they are not modified by express agreement. The terms implied on the part of the landlord are, that the tenant shall quietly enjoy the premises without hindrance from the landlord; on the part of the tenant, that he will pay rent, keep the premises in repair to a certain extent, as hereafter mentioned, and use the land, &c., in a proper manner.

When the landlord is tenant to a superior landlord, and neglects to pay his rent, and the occupying tenant is called upon to pay it to the superior landlord, he may do so, and set it off against the rent due from him to his own landlord. If a tenant has covenanted without exception or reservation to pay rent during the term of the lease, he will be bound to pay it even if the premises should be destroyed by fire or other casualty. If he should have assigned his lease to another and ceased to be in possession, he will in all cases still remain liable under his covenant to pay rent.

The rules of law as to the repairs of premises may be determined by the terms of the lease. If they are not so determined they are somewhat uncertain, and depend on a variety of circumstances, which are laid down in law treatises.

No tenant, in the absence of an agreement to that effect, is bound to rebuild after accidental destruction of the premises by fire. But under a general covenant to repair, and leave repaired, the tenant is bound to rebuild even in the case of destruction by fire.

In agricultural tenancies the lease generally determines the mode in which the farm is to be treated. Unless also the lease expressly or impliedly excludes the operation of the custom of the country, the tenant is bound to conform to it. The custom of the country means the general practice employed in neighbouring farms of a similar description, with reference to rotation of crops, keeping up fences, and other like matters. No tenant, unless he employs the land as a nurseryman or gardener, can remove any kind of shrub from the soil. Neither can a tenant remove fixtures, though put down by himself. A fixture is a chattel which is let into the soil, or united to some other which is let in. There are some exceptions to this rule in favour of fixtures used for the purpose of manufactures or agriculture, or merely ornamental purposes, where the removal will cause little or no damage. (Amos and Ferard, 'On Fixtures.')

The tenant in occupation of the premises is, in the first instance, liable for all taxes and rates of every description due in respect of the premises. The party therefore who is authorised to collect them may proceed against the tenant in occupation to recover them. It is generally a matter of agreement between the landlord and tenant that the tenant shall pay all rates and taxes except the land tax; and sometimes it is agreed that the landlord shall pay the sewer rate also. If the landlord has undertaken to pay the tenant the rates and taxes, and fails to do so, the tenant may deduct the amount from his rent, or bring an action to recover it.

Where a fixed rent has been agreed upon, has become due, and is neither paid nor tendered, the landlord, with certain exceptions, can seize growing crops, any kind of stock, goods, or chattels, upon the premises, or pasturing any common enjoyed in right of the premises, whether such things are the actual property of the tenant or not; and if the rent remains unpaid, he may sell them. A landlord can distrain on the goods of a lodger who occupies under his tenant. [DISTRESS; RENT.]

As to a surrender of a lease, see STATUTE OF FRAUDS.

A forfeiture of a lease may arise either by a breach by the tenant of one of those conditions which are implied in the relation of landlord and tenant, or by a breach of a condition which is expressly introduced into the lease, the breach of which is to be attended with a forfeiture of the tenancy, as a condition to pay rent on a particular day, to cultivate in a particular manner, &c. To this head may be referred provisoes in a lease for re-entry by the landlord on the doing or failure in doing of certain acts by the tenant, such as the commission of waste, the failure to repair, &c. If after the commission of an act of forfeiture the landlord does anything which amounts to a recognition of the tenancy, as by the acceptance of rent subsequently due, he will have waived his right to the forfeiture.

A yearly tenancy, where no period of notice is agreed on, must be determined by a notice to quit at the expiration of the current year, given six months previously. In the case of lodgings, the time, when less than a year, for which they are taken, will be the time for which a notice is necessary. Thus lodgings taken by the month or week require a month's or week's notice.

A notice to quit need not be in writing, unless the contract requires a written notice; but, from the greater facility of proving it, a written notice is always better. If a tenant, after having given notice to quit, continues to occupy, he is liable to pay double rent. If he does so, no fresh notice is necessary. If he continues to occupy after the landlord has given him notice, he is liable to pay double value for the premises.

At the expiration of the lease, the tenant is bound to deliver up possession of the premises; but if either by special agreement or by the custom of the country the tenant is entitled to the crops still standing on the land, he may enter for the purpose of gathering them, and also use the barns and stables for the purpose of threshing them. The incoming tenant may also enter during the tenancy of the preceding tenant to plough and prepare the land.

As to the recovery of rent by action see RENT.

If the tenant refuses to deliver the possession of the land, the landlord may bring an action of ejectment to recover it, and the process is simplified by 4 Geo II. c. 28. [RENT.]

By the 11 Geo. II., c. 19, and 57 Geo. III., c. 52, if a tenant, under any lease or agreement, written or verbal, though without a clause of re-entry, of lands at a rack-rent, or rent of three-fourths the yearly value, shall be in arrear for half a year's rent, and shall leave the premises deserted and without sufficient distress, any two justices of the county, at the request of the landlord, may go and visit the premises, and fix on the most conspicuous part notice in writing on what day, distant fourteen days at least, they will return again to view the premises; and if on the second day no one appears to pay the rent, and there is no sufficient distress on the premises, the justices may put the landlord into possession, and the lease shall become void. These proceedings are subject to appeal before the judges of assize for the same county at the ensuing assizes.

By 1 & 2 Vict., c. 74, where the interest of any tenant of land, &c., at will, or for a time less than seven years, liable to the payment either of no rent or a rent of less than 20*l.* a year, shall have ended or been duly determined, and the tenant shall refuse to quit, the landlord may serve him with a notice, a form for which is given in the act, to appear before a justice for the county; and if he fails to show satisfactory cause why he should not give up possession, the justices, on proof of the tenancy and of the expiration of it, may give possession to the landlord. If the landlord was not at the time of the proceedings lawfully entitled to possession, he will be liable to an action of trespass at the suit of the tenant, notwithstanding the act of parliament.

(Woodfall's *Landlord and Tenant;* Coote's *Landlord and Tenant.*)

TENANT-RIGHT is the name for a species of customary estates peculiar to the northern parts of England, in which border services against Scotland were performed before the political union of the countries. Tenant-right estates were holden of the lord of the manor by payment of certain customary rents and the render of the services above mentioned, are descendible from ancestor to heir according to a customary mode differing in some respects from the rule of descent at common-law, and were not devisable by will either directly or by means of a will and surrender to the use of the same, though they are now made devisable by 1 Vict., c. 26, s. 3. Although these estates appear to have many incidents which do not properly belong to villeinage tenure or copyhold, not being holden at the will of the lord, or by copy of court roll, and being alienable by deed and admittance thereon, it has been determined that they are not freehold, but that they fall under the same general rules as copyhold estates. (Doe *d.* Reay *v.* Huntingdon, 4 East, 271.)

TENANT IN TAIL. [TAIL, ESTATE.]

TENASSERIM, a term which has been adopted to designate those countries on the west coast of the peninsula without the Ganges which lie on the east side of the gulf of Martaban, and were acquired by the British by the peace of Yandabo (1826) from the Birmans. Tenasserim extends from 11° to 17° 40′ N. lat., and it is supposed that the eastern boundary approaches 99° 20′ E. long. The area is supposed to be about 30,000 square miles. It is separated from Birma by the river Saluen, and from Siam by a long range of mountains. Its boundary on the S. is the river Pakcham.

The coast of Tenasserim from the mouth of the Saluen River on the north (16° 30′ N. lat.) to that of the Pakcham (11° N. lat.), extends in a straight line about 450 miles. The coast is frequently interrupted by short projecting capes, by which several small harbours are formed, and a few are capable of receiving large vessels. Numerous islands occur off the coast between 14° 40′ and 8° N. lat. North of 12° they extend to the distance of 70 or 80 miles from the shore, but south of 12° N. lat. they occupy a space of only 30 miles

in width. These islands are comprehended under the collective name of the Mergui Archipelago. Seven of these islands are more than 20 miles in length. They are rugged and uneven, covered with timber-trees, but not very fertile. Two of them contain excellent harbours, King's Island Bay, opposite the town of Mergui on the mainland, and Elephant Harbour, on the north side of the island of St. Matthew.

It is supposed that a continuous range of mountains forms the watershed between the rivers flowing on one side into the gulf of Siam, and on the other into that of Bengal, and this range is the boundary-line between Siam and Tenasserim. It is also supposed that the elevation of this range varies between 3000 and 5000 feet above the sea-level. The general character of Tenasserim is hilly, and in some places even mountainous, but there are also plains of considerable extent, and some wide valleys. In the northern part of Tenasserim there is an extensive alluvial tract, which occurs where the three rivers Saluen, Gyeng, and Attayen join. The Saluen rises in the S.W. part of China, and has a very rapid course through Tenasserim, which renders it unfitted for navigation; the Attayen is a short but deep river; the Gyeng is broad but shallow. These three rivers unite nearly at the same place, about 30 miles from the open sea, and by their confluence form a broad sheet of water, which is about 15 miles long by 6 wide, and interspersed with numerous wooded islands. This expanse of waters finds its way to the sea by two channels, which enclose an island. The southern channel is about 20 miles long, and forms the river Martaban.

The most important river of the central part of the country is the Tenasserim. It flows in a southern direction over nearly 3° of latitude, or more than 200 miles in a straight line. The Little Tenasserim joins it at its most southern bend, and brings down a large volume of water from the Samroiyot Mountains. Up to this place, where the town of Tenasserim is built, the river is deep enough for vessels of 100 tons. At the same place the Tenasserim turns to the west, and enters the sea by six or seven channels. The upper part of the river is much interrupted by rapids and falls. Another large river is the Tavoy, which rises about 15° N. lat., and reaches the sea by a wide æstuary, about 13° 30′ N. lat. The town of Tavoy is about 35 miles from the sea, and so far vessels of 120 tons burden may ascend. The southern region of Tenasserim, or that which lies between 12° and 11° N. lat., is part of the long isthmus which connects the Malay Peninsula with the main body of Asia, and is known as the Isthmus of Krah. It is the least known portion of Tenasserim.

Like all other intertropical countries, Tenasserim has only two seasons, the dry and the wet season. They depend on the monsoons, the rains being produced by the south-west monsoon, whilst the dry season lasts during the north-east monsoon. The climate is considered very healthy.

Rice constitutes the principal object of cultivation: but it does not appear that irrigation is practised; and only one crop is taken. Wheat is cultivated at a few places on a small scale. Other objects of agriculture are sesamum, chilies, yams, sweet potatoes, plantains, and melons. The sugar-cane, indigo, and tobacco, are only grown for home consumption, and also cotton, but it is of an inferior kind. Among the trees which are cultivated the most important is the areca palm. Of late years coffee-trees, nutmeg-trees, and clove-trees have been introduced. Nearly all the delicious fruits which grow in the Malay Peninsula and the Indian Archipelago may be raised in Tenasserim. Nearly the whole of Tenasserim is covered with timber-trees, among which the teak-tree is becoming very valuable. In addition to timber, the natural productions, which are derived from the forests and plants which grow wild, are numerous. There are various kinds of trees yielding caoutchouc, stick-lac, gamboge, sassafras, cajeput-oil, different gum-resins, nut-oil, black varnish, sandal-wood, several tanning substances, several dyes, aloes, and sapan-wood.

Domestic animals are not numerous, with the exception of buffaloes. The wild animals include the Malay bear, the tiger, the leopard, the elephant, the rhinoceros, the tapir, and the wild hog. The birds are numerous, and many of them have splendid plumage.

Tenasserim is known to be rich in minerals, although they are not yet much worked. Gold, silver, copper, tin, iron, antimony, coal, and marble, are among the most abundant of the minerals.

The population of Tenasserim has been estimated at about 100,000. The bulk of the population consists of Birmans, Thalains, Siamese, and Karians or Karens. The Mongol blood is traceable in all these races, modified by admixture with other races. The Birmans are the chief race; they are mostly agriculturists. There are a few settlers from Bengal and Coromandel. As Tenasserim is the penal settlement for the British possessions in Hindustan, many convicts have been sent there, especially Thugs. The English settled in Tenasserim are almost all in official capacities, either civil officers of government or the military officers of the regiments which are stationed there.

In a country so little cultivated, and the population of which is dispersed over such an extent, there can be no large towns. When the British took possession of the country they founded the town of Amherst, near the mouth of the river Martaban. [Amherst.] Maulmain, which was at first only a military post, has since risen into importance, and is rapidly increasing, as its situation near the confluence of the Attayen with the Saluen is the most favourable place for carrying on the trade in teak, which constitutes the most important article of export. Ship-building is the only trade which is carried on to any extent. The other chief towns are Tavoy, Mergui, and Tenasserim.

If we except the building of vessels and small craft at Mergui, Tavoy, and especially Maulmain, there is little manufacturing industry in Tenasserim; most of the articles of use being imported.

The chief exports are teak and rice; there are also exported ivory, wax, tin, nut-oil, trepang, edible birds' nests, and bamboos.

Nothing is known of the early history of these provinces. When they were first visited by the Portuguese several places were much more thriving than they now are. It was possessed successively by the Peguans, the Siamese, and the Birmans, and finally passed into the hands of the British by the peace of Yandabo (1826).

TENBURY. [WORCESTERSHIRE.]

TENBY. [PEMBROKESHIRE.]

TENCE. [LOIRE, HAUTE.]

TENCH. [TINCA.]

TENDER. A tender is the offer to perform some act. In practice it generally consists in an offer to pay money on behalf of a party indebted, or who has done some injury, to the creditor, or to the party injured.

A tender to the amount of 40*s.* may be in silver; but beyond that amount it must be in gold, or in Bank of England notes payable to bearer on demand for any sum above 5*l.* (3 & 4 Wm. IV., c. 6.) The money must be produced and shown, or the bag or other thing which contains it shown to the party to whom it is intended to be given, unless this is dispensed with by some declaration or act of the creditor. The offer must also be absolute and without conditions.

If the defendant in an action plead a tender, he must state that he has always been ready to pay the money, and he must also pay it into court. The effect of the plea is to admit the existence of the contract or other facts stated in the declaration which form the cause of action in the plaintiff. The plea goes only in bar of damages. The plaintiff therefore in such case can never be nonsuited: but if issue is taken on the mere fact, whether or not the tender has been made, and that fact is found for the defendant, it is a good defence to the action.

By various statutes, magistrates, officers of excise, &c., are empowered, after notice of action to be brought against them, to tender amends; and if the amount tendered is sufficient, the tender is a defence to the action.

TENDON, or *Sinew*, is the tough white and shining tissue by which muscles are attached to the bones or other parts which it is their office to move.

The fibrous or tendinous tissue is of a peculiarly glistening bluish-white colour, dense and tough, nearly insensible, not vitally-contractile, and very little elastic. It is composed of bundles of delicate fibres, which are united by cellular tissue; and each fibre is made up of several fibrillæ, or filaments, which are discernible only with the microscope. The filaments are transparent and cylindrical, with well-defined outlines: they vary in diameter from $\frac{1}{35000}$ to $\frac{1}{10000}$ of an inch, and, though they have a generally straight direction, are finely undulated. The tendinous fibres are from $\frac{1}{1607}$ to $\frac{1}{3710}$ of an inch in diameter; the filaments are arranged within them in parallel lines, and are connected by a firm substance, in which no distinct structure can be discerned. The bundles of the fibres are arranged in various plans in the different tendons and aponeuroses: in some, they are parallel; in some, interlaced or variously woven together; but their arrangement is always such that they possess the greatest force of resistance in the direction in which the muscle acts upon them. The tendons, like the other fibrous tissues, are composed of a substance slowly yielding gelatine by boiling.

At that end of a tendon which is affixed to a muscle each primitive fibre or fasciculus of the muscle terminates in an abruptly-rounded extremity, which is embraced by a fasciculus of the filaments of the tendon, expanding and enclosing it in a sheath, or in a manner which may be coarsely represented by placing the end of the fore-finger of one hand within a circle formed by the ends of all the fingers of the other hand. The larger bundles of cellular and fibrous tissue in the tendon are also continuous with the cellular tissue which is placed between the secondary fasciculi of the muscle.

At their opposite extremities the tendons are usually affixed to bones. Their fibres are intermixed and firmly united with those of the periosteum, and often pass into the very substance of the bone.

Although the chief and proper office of tendons is to serve as media for the action of muscles, yet many of them fulfil other purposes in the economy. Thus the aponeuroses of the abdominal muscles form a great part of the walls of the abdomen, and, by their toughness, support and protect the organs within its cavity; the tendons of the muscles of the fingers add strength to each joint over which they pass; and many, in other parts, are arranged so as to act like ligaments.

TENDRILS, or *Cirrhi*, are those elongated and filamentous organs of plants which possess a power of twisting in one direction or another, and by which the plants on which they grow are enabled to embrace other plants, and thus to elevate themselves. Tendrils are only found on those plants which are too weak in the stem to enable them to grow erect. In most cases the tendrils are only forms of the petiole; for although they may occur on the parts of flowers, yet the flowers must be regarded as metamorphoses of the leaf.

TE'NEDOS, an island in the Greek Archipelago, off the coast of Troas, in 39° 47′ to 39° 51′ N. lat. According to Homer ('Il.,' xi. 624), it was sacked by Achilles, and occupied by the Greeks when they retired from the siege of Troy immediately before its capture. (Virg., 'Æn.,' ii. 21.) This connection with the story of the Trojan war has given Tenedos some celebrity. It was colonised by Æolians from Amyclæ in Laconia. Little mention is made of Tenedos in ancient history. The greatest length of the island is from east to west; the town with its harbour is situated in a low and sheltered spot at the north-east corner. The aspect of Tenedos from the sea is barren, but it is cultivated in the interior, and produces wheat and very fine red wine.

TENEMENT, in its usual and popular acceptation, is applied only to houses and other buildings; but in its original proper and legal meaning it includes everything of a permanent nature that

may be an object of tenure, or may be held in the legal sense, whether corporeal or incorporeal. It includes not only land, but every modification of right concerning it. Thus the word 'Liberum tenementum,' frank-tenement, or freehold, is applicable not only to lands and other solid objects, but also to offices, rents, commons, and the like. (Harg., Co. Litt., 154, a. n. 7.)

TENERIFFE. [CANARIES.]

TENIERS, DAVID (the Elder), was born at Antwerp in 1582. He studied painting under Rubens, and also under his countryman Adam Elsheimer at Rome. It was here that he acquired the neatness of pencilling which, with the knowledge of colours acquired under Rubens, gives to his works so great a charm.

Returning to his native country after ten years' absence, he devoted himself with great ardour to the practice of his art, and chose chiefly the familiar scenes of ordinary Flemish life for his subjects. He may be considered as the inventor of a new manner, which was followed and carried to a still higher degree of perfection by his son. He died at Antwerp in 1649.

TENIERS, DAVID (the Younger), was born at Antwerp in 1610, and received his principal instruction from his father, whose subjects and style he adopted.

The Archduke Leopold having seen some of his pictures, appointed him his principal painter and gentleman of his bedchamber, and gave him the direction of his gallery of paintings. Teniers made copies of this gallery, in which the touch, the colouring, and the manner of the several painters, were reproduced with such fidelity, that he acquired the name of the Proteus of painting. It is worthy of remark that while of all the Flemish painters his works are the most popular, he associated with the higher classes of society. Besides the Archduke Leopold, he was honoured with the favour of many eminent personages. He often assisted the landscape painters of his time by inserting figures into their pictures. The galleries and collections in England contain a great number of his finest works. He died at Brussels in 1694.

TENIMBER ISLANDS. [SUNDA ISLANDS.]

TENISON, THOMAS, the son of a clergyman in the diocese of Ely, was born at Cottenham in Cambridgeshire, in 1636, and educated in the grammar-school at Norwich, whence he passed to Corpus Christi College, Cambridge, in 1653, and took his bachelor's degree in 1657. About 1659 he was privately ordained in the episcopal method then proscribed by the government. The restoration of the king soon following, he was made minister of St. Andrew's Church in Cambridge, and rector of Holywell in Huntingdonshire. He had also the church of St. Peter Mancroft in Norwich. This brings down his history to 1680, when, being then doctor in divinity, he was presented to the living of St. Martin's in the Fields.

In this situation he acted with great prudence and liberality. He gave more than 300*l.* to the poor of his parish in the time of the distress occasioned by the hard frost of 1683, endowed a free-school, and built and furnished a library. The school and library still exist. In his politics he was a Whig, and a favourer of the Revolution, and was accordingly early marked out by King William for advancement in the church. In 1689 he was made archdeacon of London, and in 1691 bishop of Lincoln. In 1694 he was made archbishop of Canterbury. He died Dec. 14, 1715.

Archbishop Tenison has left no writings behind him which can establish for him a literary reputation; but he published several treatises, mostly connected with the religious and political controversies of his age.

TENNANT, SMITHSON, was born at Selby, in Yorkshire, Nov. 30, 1761. He was the only child of the Rev. Calvert Tennant. In 1781 he went to Edinburgh with the intention of studying medicine. He did not however continue long in that university, for in Oct., 1782, he was admitted a member of Christ's College, Cambridge.

In 1784 he made a continental tour, in the course of which he became acquainted with some eminent chemists. In Jan., 1785, he was elected a F.R.S., and in 1786 he left Christ's College and removed to Emmanuel College; in 1788 he took his degree as bachelor of physic, and soon after quitted Cambridge and came to reside in London. In 1796 he took a doctor's degree at Cambridge, but as his fortune was independent, he relinquished all idea of practice as a physician. In 1813 he was elected professor of Chemistry at Cambridge.

In Sept., 1814, Mr. Tennant went for the last time to France, and on his return home, Feb. 20, 1815, he arrived at Boulogne with Baron Bulow, in order to embark there. Being detained by adverse winds on the evening of the 22nd, they took horses and went to see Bonaparte's pillar, about a league off, and going off the road on their return to look at a small fort, of which the drawbridge wanted a bolt, they were both thrown, with their horses, into the ditch. Baron Bulow was merely stunned, but Mr. Tennant's skull was so severely fractured, that he died within an hour afterwards.

The 'Philosophical Transactions' contain eight papers by Mr. Tennant:—1, 'On the Decomposition of Fixed Air,' 1791; 2, 'On the Nature of the Diamond,' 1797; 3, 'On the Action of Nitre upon Gold and Platina;' 4, 'On the Different Sorts of Lime used in Agriculture,' 1799; 5, 'On the Composition of Emery,' 1802; 6, 'On two Metals found in the Black Powder of the solution of Platina,' 1804; 7, 'On an easier Mode of procuring Potassium than that which is now adopted;' 8, 'On the Mode of producing a Double Distillation by the same Heat.'

TENNANTITE, a variety of gray copper-ore, which occurs in cubic crystals, moderately hard, brittle, and grayish white. When heated by the blow-pipe, it decrepitates, and burns with a blue flame, emitting arsenical vapours, and then fuses into a black scoria, which is attracted by the magnet. It is a compound of sulphur, copper, iron, arsenic, and silica.

TENNESSEE, one of the United States of North America, lies between 35° and 36° 40′ N. lat. and between 81° 30′ and 90° W. long. It is

bounded N. by Kentucky and Virginia, E. by North Carolina, W. by Arkansas, and S. by Mississippi, Alabama, and Georgia. The greatest length E. to W. is about 445 miles; the mean breadth N. to S. is 114 miles. The area is 45,600 square miles. The population in 1840 was 829,210, of whom 183,049 were slaves.

Surface and Soil.—This state is naturally divided into three regions, which may be called the Eastern or Mountain Region, the Middle or Hilly Region, and the Western or Level Region. East Tennessee and West Tennessee are nearly equal in extent, each comprehending about 10,000 square miles; the Middle Region is about 25,000 square miles.

East Tennessee lies within the ranges of the Appalachian Mountains. This extensive mountain-system may be said to commence along and near the southern boundary-line of Tennessee. Near 35° N. lat. and 82° W. long., on the boundary-line between South and North Carolina, the country forms a ridge of hills which extends westward to 85° W. long., a distance of more than 160 miles. In the Carolinas it is known by the name of the Blue Ridge. W. of 85° W. long. it forms a kind of mountain-knot, consisting of several ridges, which extend S.W. and N.E. From the eastern extremity of this mountain region, W. of 82° W. long., another ridge runs in a general N.E. direction, which is also called the Blue Ridge, being considered as the continuation of the before-mentioned Blue Ridge, and from its western termination (near 86° W. long.) there runs another ridge called the Cumberland Mountains, first N.N.E., and afterwards E.N.E. and N.E. The space included between these two ranges extends from E. to W. about 200 miles. It is traversed by several minor ridges, among which the most elevated and least interrupted is called the Iron Mountains. The mountain-region of Tennessee occupies the tract enclosed by the Iron Mountains and the Cumberland Mountains, whose most elevated parts are about 70 miles distant from one another.

The *Hilly* or *Middle Region* extends from the Cumberland Mountains westward to the river Tennessee, where it traverses the state, running from S. to N. The general level of this region is several hundred feet above the sea-level, and it is covered with numerous hills, which form several continuous ridges.

West Tennessee lies between the Tennessee and the Mississippi. The surface is traversed by some swells of high ground, generally about 12 miles from the western bank of the Tennessee, and is several miles wide. Other swells traverse the southern districts, running from S.E. to N.W., and terminating on the banks of the Mississippi with the Chickasaw Bluffs. The N.W. districts form nearly a dead level, which descends imperceptibly to the banks of the Mississippi, where it terminates in a large wooded swamp, called the Wood Swamp.

Rivers.—Numerous rivers drain this state, and some of them have a long course. The larger rivers are navigable for keel-boats and for steam-boats, but only during the boating-season, which

generally commences on the 20th of February, and terminates early in June.

The Tennessee rises with numerous branches in the Appalachian Mountains: the most remote of them originate in Virginia near 81° 20′ W. long. and 37° N. lat., and run S.W. The largest branches are the Clinch, the Holston, the French Broad River, and the Hiwassee. After these numerous branches have united, the Tennessee traverses the mountain-knot between 34° and 35° 20′ N. lat. It passes through the ridge with great impetuosity over a rocky bed: its course within the mountain-tract is very rapid, and it escapes from it by another gap in Alabama. At this place it changes the S.W. course into a W. course, and after draining Alabama for about 200 miles, it returns to Tennessee. The lower course of the Tennessee, as far as it lies within Tennessee, is from S. to N. After having entered Kentucky it gradually declines to the W., and falls into the Ohio. The whole course of the Tennessee probably does not exceed 1000 miles.

The Cumberland River rises in Kentucky, in the valley formed by the Cumberland Mountains and the Laurel Mountains, and traverses that state by a general W. course: after flowing about 150 miles it turns S.W. and enters Tennessee, where it soon resumes its W. course. It drains the northern districts of Tennessee by a course of about 200 miles; and turning gradually more to the N., re-enters Kentucky, where its general course is N. It falls into the Ohio a few miles above the mouth of the Tennessee. This river runs about 450 miles, and as the current is very gentle, the navigation is easy for steam-boats as far as Nashville, more than 200 miles from its mouth, and is navigable for river-boats 150 miles farther up.

Climate.—The general level of the Mountain Region being about 800 feet more elevated than the level tract on the Mississippi, which is about 300 feet above the sea, there is of course a considerable difference in the climate of the two regions. The winter in the Mountain Region lasts for some weeks, and the frost is rather severe. In the countries W. of the range the rivers are generally covered with ice for a few days in the winter. Snow falls to the depth of ten inches, but seldom lies more than 12 or 15 days on the ground. In winter and spring a considerable quantity of rain falls; but in the other seasons rain is not frequent, nor does it continue for any length of time.

Productions and Manufactures.—In 1840 the quantity of maize grown amounted to 42,467,349 bushels, a quantity much larger than that produced in any other of the United States. As this grain is best adapted for the feeding of hogs, the number of hogs was also larger than in other states, amounting to 2,795,630. Oats were raised to the amount of 6,770,116 bushels; wheat, 4,547,273 bushels; potatoes, 2,373,034 bushels; rye, 297,033 bushels; buckwheat, 6187 bushels; and barley only 4758 bushels. The quantity of cotton amounted to 128,250,308 lbs. Flax and hemp yielded 45,053 tons, and the meadows only 38,512 tons of hay. Small quantities were pro-

duced of rice, hops, silk, wine, and maple sugar. The value of the produce of the orchards was estimated at 336,767 dollars. The lumber was estimated at 2,000,266 dollars, besides 3119 barrels of pitch, tar, turpentine, and resin. The number of horses and mules amounted to 327,526, that of neat cattle to 773,390, and that of sheep to 748,459. The quantity of wool was 1,029,526 lbs. There were 26 woollen manufactories and 38 cotton manufactories; 34 furnaces, which produced 16,128 tons of cast-iron; 99 forges, which produced 9673 tons of bar-iron; 454 tanneries; and 1426 distilleries, which produced 1,109,107 gallons of spirits. The commerce is small, as compared with other states.

In the Mountain Region deer are still abundant, and there are bears, pumas, wild-cats, wolves, beavers, otters, and musk-rats. Racoons, foxes, squirrels, opossums, polecats, and minxes, are very numerous: pheasants, partridges, pigeons, swans, wild turkeys, ducks, and geese, are abundant. Lead exists in the mountains bordering on North Carolina, but is not much worked. Iron-ore is found in great abundance on the south side of the Cumberland River, and also at a few other places.

Political Divisions and Towns.—Tennessee is divided into 72 counties. *Nashville*, the seat of government, is situated on the S. bank of Cumberland River, in 36° 9′ N. lat., 86° 49′ W. long. It contains a court-house, market-house, gaol, a state penitentiary, lunatic asylum, and 11 places of public worship. Nashville University, founded in 1806, had, in 1849, 398 alumni, 75 students, 7 instructors, and a library of 9456 volumes. The population of Nashville in 1840 was 6929. *Knoxville*, 183 miles E. by S. from Nashville, is situated on the N. bank of the river Holston, at the head of steam-boat navigation. It contains a court-house, gaol, and 3 places of public worship. The population in 1840 was 1500. *Memphis*, 230 miles W.S.W. from Nashville, is situated on an elevated bluff on the left bank of the Mississippi, and has an extensive commerce, equal to that of any other town between St. Louis and New Orleans. It contains 4 places of public worship, and had in 1840 a population of 3300.

History and Constitution.—The first settlements in Tennessee were made about the middle of the last century, but in 1760 they were destroyed by the Cherokees, then the possessors of this country, from the northern and central part of which they were expelled in 1780. Since that time the number of settlements has continually and rapidly increased. Up to 1790 Tennessee formed a part of North Carolina, but in that year it was ceded by that state to the United States, who converted it into a Territory. In 1796 it was constituted a State. The legislature consists of 25 senators, who are elected for 2 years, and 75 representatives, who are elected for 2 years. The governor is also elected for 2 years. Tennessee sends 2 senators and 11 representatives to Congress.

TENOR, the name of the most common of adult male voices, that which is between the extremities of *Alto* and *Basso*. The compass of the Tenor is from C, the second space in the base, to G, the second line in the treble.

The tenor and treble are reciprocally at the distance of an octave.

The *Tenor Clef* is used for the tenor-voice, the tenor-trombone, and sometimes the violoncello.

TENOS, now *Tino*, a small island in the Greek Archipelago lying to the south-east of Andros, and between that island and Myconus, and forming one of the group called the Cyclades. *S. Nicolo*, on its north coast, is in 37° 30′ N. lat. and 25° 15′ E. long. It is about 15 miles long, and its greatest length is from N.W. to S.E. The island produces good wine.

TENREC (*Centetes*, Illiger; *Centenes*, Desm.; *Setiger*, Geoff.). The Tenrecs may be considered, indeed they have been considered by most zoologists, as Hedgehogs without the power of rolling themselves up into a ball. They were not included in the genus *Erinaceus* of Linnæus, as he left it, in his last edition of the 'Systema Naturæ' (the 12th), but in the 13th (Gmelin's) all the known species were included under that genus. They have no tail, are nocturnal for the most part in their habits, feed on insects, lie dormant during a considerable portion of the year, and that during the hot season, and have the skin beset with spines or spine-like bristles. Zygomatic arch wanting or rudimentary. Locality, Madagascar. Examples, *Centetes ecaudatus*, *C. setosus*, *C. semispinosus*.

Striped Tenrec (*Centetes semispinosus*).

TENSION (Mechanics), the name given to the force by which a bar or string is pulled, when forming part of any system in equilibrium or in motion. Thus when a weight is supported by a string, the tension of the string is the weight which is suspended to it.

TENT, MILITARY, is a temporary dwelling-place made of canvas, which is supported by one pole, or more, and distended by means of cords, which are made fast to pickets driven into the ground. Tents are set up when an army is encamped in the field either for actual service or for the purpose of performing military exercises.

The tents of the private soldiers, whether infantry or cavalry, are of a conical form with circular bases 13 feet 3 inches in diameter, the supporting pole or standard of each being planted vertically in the ground, in the centre. Fifteen infantry, or twelve cavalry soldiers occupy such a tent. The round tent of an officer is 12 feet 6 inches in diameter. The marquees of officers, as well as the

hospital and laboratory. tents, are of oblong forms on the plan.

TENTERDEN. [KENT.]

TENTERDEN, CHARLES ABBOTT, LORD, born at Canterbury, Oct. 7, 1762, was the son of a barber, who has been described as 'a tall, erect, primitive-looking man, with a large club pigtail, going about with the instruments of his business, and attended frequently by his son Charles, a youth as decent, grave, and primitive-looking as himself.' Charles was entered in 1769 on the foundation of the king's school of the cathedral, where he was distinguished for his accuracy and steadiness. During his residence at Oxford he obtained, in 1784, the chancellor's medal for the best Latin verses on Lunardi's balloon; and in 1786 he also obtained the chancellor's medal for an essay 'On the Use and Abuse of Satire.' He was elected a fellow of his college (Corpus Christi), and appointed junior tutor. By the advice of Mr. Justice Buller, whose son was one of his private pupils, he entered himself of the Inner Temple in 1788, and he was called to the bar in 1795, after practising some time as a special pleader.

Abbott selected the Oxford circuit, and speedily got great business. He was master of all the technicalities of pleading, and ready in suggesting cases in point, to which advantages he owed his appointment by Sir Vicary Gibbs, when solicitor-general, as the junior counsel to whom the business of the government is entrusted. He very seldom appeared as a leader, and when he did he was so little satisfied with his own performance that he declined to lead whenever a refusal was possible. His legal arguments were good without reaching the highest degree of excellence. In 1802 he published a valuable 'Treatise of the Law relative to Merchant Ships and Seamen,' which has gone through many editions. It is one of the best English law treatises.

In Feb., 1816, he was offered a seat as puisne judge in the Court of Common Pleas, and accepted it. In May of the same year, on the death of Mr. Justice Le Blanc, he yielded to the importunity of Lord Ellenborough, and was chosen to supply the vacancy in the Court of King's Bench, and was knighted about the same time. On Nov. 4, 1818, Sir Charles Abbott succeeded Lord Ellenborough as chief-justice of that court.

It has been alleged that at the outset of his judicial career Chief-Justice Abbott was apt to lose himself among the minute details of the cases which were brought before him. It is allowed at the same time that during the last seven or eight years of his time he took broader and more comprehensive views of questions, and displayed great judicial capacity. He had learned to deal with facts, and his law was safe, accurate, and ready. His statements and decisions were clothed in correct, succinct, and appropriate language. He was averse to over-curious subtleties; loved to overrule technical objections both in civil and criminal pleadings; and showed great anxiety to make his decisions accord with common sense and substantial justice. Perhaps he shone most in the management of arguments which required a combination of scientific with legal knowledge; 'to see him preside over a complicated patent case was a very great treat, whether to a lawyer or a man of science.' A reasonable distinction, a reasonable interpretation of the law, were his favourite phrases. He was rather impatient of the check of a jury; and was not always able to keep his temper in command when arguing with the bar. His impartiality, as far as the parties were concerned, was unquestioned.

Sir Charles Abbott was raised to the peerage in 1827, by the title of Baron Tenterden. In the House of Lords he pertinaciously opposed the passing of the Corporation and Test Act Repeal Bill; and was the most impressive speaker against the Roman Catholic Relief Bill. He also recorded his protest against the Reform Bill. He took at the same time an active part in the business of legislation. Among his well-studied and carefully-prepared acts are—9 Geo. IV., c. 14, for the alteration of the law as to the limitation of actions of account and upon the case; 9 Geo. IV., c. 15, to prevent a failure of justice by reason of variances between records and writings produced in evidence; 1 Will. IV., c. 21, Mandamus and Prohibition Acts; 1 Will. IV., c. 22, Interrogatories Act; 1 & 2 Will. IV., c. 58, Interpleader Act; 2 & 3 Will. IV., c. 39, Uniformity of Process Act; 2 & 3 Will. IV., c. 71, Prescription Acts; and (prepared under his sanction) 3 & 4 Will. IV., c. 27, for the limitation of actions and suits relating to real property, and for simplifying the remedies for trying the rights thereto.

His favourite recreations during the long vacation were the perusal of the classics, the study of botany, and the composition of Latin verses on flowers and plants. He founded and endowed, in the grammar-school of his native city, two annual prizes; the one for the best English essay, the other for the best Latin verse. In his relaxations, as in the discharge of his public duties, he displayed a mind narrow, it may be, and unimpassioned, but active, dexterous, and elegant. He died in Nov., 1832.

TENTHRE'DO, a genus of Hymenopterous insects of the section *Terebrantia*. The genus *Tenthredo* of Linnæus is in modern systems regarded as constituting a family, to which the name *Securifera* has been applied by Latreille, and *Tenthredinidæ* by Leach.

Latreille restricts the generic term *Tenthredo* to those species which have nine joints to the antennæ, and in which these organs are not distinctly thickened at the apex. Their larvæ have from eighteen to twenty-two feet. The genus *Tenthredo* is however still further restricted by many other authors, and it is especially to Dr. Leach ('Zoological Miscellany,' vol. iii.) that we are indebted for pointing out distinguishing characters for the subdivisions of the very extensive Linnæan genus. By this author the *Tenthredinidæ* are divided chiefly according to the structure of the antennæ, and the cells enclosed by the nervures of the wings. Dr. Leach resolves the group into six sections.

TENTHS are the tenth part of the yearly value of all ecclesiastical livings. They were

formerly claimed by the pope. When the authority of the pope was extinguished at the Reformation, Henry VIII. transferred the revenue of the tenths to the crown, and had a new valuation of all the livings, so as to obtain the tenth of their true yearly value at that time. (36 Hen. VIII., c. 3, s. 9-11.) By royal grants under 1 Eliz., c. 19, s. 2, the Archbishop of Canterbury and the Bishop of London were exempted from tenths, and were also authorised to receive the tenths of several benefices as a compensation for certain estates which were alienated from their sees. By the 6 Anne, c. 24, all benefices were discharged from the payment of tenths which, at that time, were under the annual value of 50*l.*, except those of which the tenths had previously been granted by the crown to other parties. There are also some other special exemptions. At the present time, out of 10,498 benefices, with and without cure of souls, there are 4898 which remain liable to tenths. ('Parl. Rep. First-Fruits and Tenths,' 1837, No. 384.) Queen Anne gave up the revenue arising from tenths, as well as from first-fruits, which had been enjoyed by her predecessors since the Reformation, and by act 2 and 3 of her reign, c. 11, assigned it to the augmentation of poor livings; for which purpose she erected a corporation by letters patent in 1704 to administer the funds, called the Governors of Queen Anne's Bounty. This act declared that episcopal sees and livings not exempted should continue to pay in such rates and proportions only as heretofore, or according to the valuation of Henry VIII., commonly known as the 'King's Books.' Tenths under the act 1 Vict. c. 20 are collected by the Treasurer of the Governors of Queen Anne's Bounty. [BENEFICE; FIRST FRUITS.]

TENTO'RI, CRISTO'FORO, born in 1745, in Spain, of a Venetian family, studied first in his native country, and afterwards removed to Venice. He published, in 1785, his first work, 'Storia Civile e Politica della Repubblica di Venezia, con una Descrizione Corografica e Topografica de' suoi Stati,' Venice, 12 vols. 8vo. His second work was 'Raccolta Cronologico-Ragionata di Documenti inediti che formano la Storia Diplomatica della Rivoluzione e Caduta della Repubblica di Venezia, corredata di Critiche Osservazioni,' 2 vols. 4to., 1799, published without the author's name. He published several other works of less importance.

Tentori lived and died poor. He filled in the latter years of his life the office of preceptor in the family of Tiepolo at Venice. As a native of Spain he was required by Napoleon's police, in 1808, to swear fidelity to the intrusive King Joseph, which having refused to do, he was kept under arrest for a long time. He died in 1810, at Carbonera, the country residence of the Tiepolo family.

TENUIPE'DES, Lamarck's second division of the *Conchifera Dimyaria*, consisting of the *Mactracea*, *Corbulacea*, the *Lithophaga* (*Saxicola*, *Petricola*, and *Venerupis*), the *Nymphacea*, the *Cardiacea*, the *Trigonacea*, the *Naiades*, and the *Chamacea*.

In the first division, *Crassipèdes*, are comprised the *Tubicolées*, the *Solenacea*, and the *Myaria*.

M. Deshayes, in the last edition of Lamarck, objects, and we think with reason, to these divisions as being defective; nor does he consider the arrangement capable of amelioration, because the principal character is too exclusive. He observes that to follow it rigorously it would be necessary to break very natural links which bind certain genera together.

TENUIROSTRES. Cuvier made the *Tenuirostres* the fourth family of his *Passeraux*, placing it between the *Conirostres* and the *Syndactyles*, and comprising under it the genera *Sitta*, Linn. (with the subgenera *Xenops*, Ill.; *Anabates*, Temm.; and *Synallaxis*, Vieill.); *Certhia*, Linn. (with the subgenera *Certhia*, Cuv.; *Dendrocolaptes*, Herm.; *Tichodroma*, Ill.; *Nectarinia*, Ill.; *Dicæum*, Cuv.; *Melithreptus*, Vieill.; *Cinnyris*, Cuv.; and *Arachnathera*, Temm.); *Trochilus*, Linn. (dividing the genus into the Humming-Birds properly so called, or *Colibris*, *Trochilus*, Lacép.; and the *Oiseaux Mouches*, or Fly-Birds, *Orthorhynchus*, Lacép.); *Upupa*, Linn. (with the subgenera *Fregilus*, Cuv.; the Hoopoes properly so called, *Upupa*; *Promerops*; and *Epimachus*).

TENURE. The general nature of tenure and its origin and history in England are explained in the article FEUDAL LAW. The articles COPYHOLD, DISTRESS, ESCHEAT, FEALTY, FORFEITURE, MANOR, RENT, TENANT AND LANDLORD, may also be consulted.

TEOS, now called Búdrúm, a town of Ionia, situated on the south side of the peninsula between the Gulf of Smyrna and the Gulf of Clazómenæ, near Cape Courco, in 38° 15′ N. lat., 26° 30′ E. long. It was originally colonised by Minyæ from Orchómenus, and afterwards strengthened by a colony from Athens at the time of the Ionian migration. Teos was one of the twelve cities which formed the confederacy of the Panionium. (Herodotus, i. 142.) On the conquest of Ionia by Cyrus the Teians retired to Abdéra in Thrace, where they founded a colony which eclipsed the parent state. (Herod., i. 168.) Teos was the birth-place of Apellicon, the preserver of the works of Aristotle and of Anacreon. At Teos there are remains of the old walls, which were about five miles in circuit, of a theatre, and of a temple of Bacchus.

TEPHRO'SIA, the name of a genus of plants belonging to the papilionaceous division of the order *Leguminosæ*. The American and Asiatic species are in some measure distinguished by their properties. In the former a narcotic poison is more frequently secreted; in the latter a colouring-matter. *T. toxicaria*, the Poison Tephrosia, is a native of the West Indies and of Guiana, and is said by Tussac to have been first brought from Africa. The whole plant affords a narcotic poison, and if the leaves are taken and pounded, and then thrown into water where there are fish, the fish become intoxicated, and losing all power over their muscles, they float about as if dead, and may be easily caught. *T. Virginiana*, the Virginian Tephrosia, is found in woods on dry and sandy soils in North America from Canada to Florida. *T. emarginata* is a native of South America.

The root possesses the same properties as the *T. toxicaria*, and is also used for the purpose of poisoning fish. *T. tinctoria*, the Ceylon Indigo, yields a blue colouring-matter, which has the same properties as true indigo, and is used in Ceylon for the same purposes. *T. Senna*, Buga Senna, grows on the banks of the river Cauca, near Buga, in Popayan. Its leaves have a purgative quality like senna, and are used by the natives for the same purposes as that plant is used.

TEPLITZ, TOEPLITZ, or TEPLICE, a town in the circle of Leitmeritz in the kingdom of Bohemia, celebrated for its warm sulphureous springs, is situated in 50° 38′ N. lat., 13° 50′ E. long. The town, which has not above 2800 inhabitants, is situated on the Saubach, in a beautiful valley four leagues in length and one in breadth, formed by the Erzgebirge and the Mittelgebirge. It forms an irregular quadrangle, is about half a league in circuit, and has three gates. The principal buildings are—the palace of Prince Clary (to whom the town belongs) with an extensive garden and park in which there is a ball-room and a pretty theatre; the church of St. John the Baptist; the townhall, built in 1806; and the chapel of the Cross, outside of one of the gates. The town is connected by a row of handsome houses with the village of Schönau. There are several springs both in the town and in Schönau, each of which supplies several public and private baths distributed in different establishments. 'The quantity of water which the principal spring yields,' says Dr. Granville, 'is not less than a thousand large pailfuls in an hour.' The temperature of the springs is said to have increased within the last forty years from 117° to 122° Fahrenheit, which is the present temperature of the chief spring. The medicinal effects of the hot springs of Teplitz are allowed by all physicians acquainted with them to be very beneficial in cases of suppressed gout, chronic rheumatism, diseases of the joints, contracted limbs, old wounds, obstinate cutaneous eruptions, and paralytic affections. The baths are visited by the imperial and royal families of Austria, Russia, and Prussia, some of whom have built palaces for themselves and public hospitals for their invalid soldiers. The total number of visitors in a year amounts to about 15,000; the greatest number staying at one time, in the height of the season (July and August), is about 5000. Besides the attraction of its waters, it may be added that the expense of living at Teplitz is far less than in any other watering-place in Germany, that the private baths are fitted up in a manner unquestionably superior to those of any other spa in that country, and that there are ample sources of recreation and amusement without gaming, which is wholly prohibited.

TERAMO. [ABRUZZO.]

TERASSON. [DORDOGNE.]

TERBURGH, GERARD, was born at Zwoll, near Overyssel, in 1608, and was instructed in the rudiments of painting by his father. After acquiring considerable reputation in the Netherlands as a painter of small-sized portraits, he visited Italy, and then practised with great success at Paris. From France he returned to Holland. He visited Münster during the sitting of the celebrated congress at which the treaty that terminated the Thirty Years' War was concluded. Here he painted his most celebrated picture, containing the portraits of the sixty-nine plenipotentiaries assembled on that occasion. He next visited Spain, where he was received with great favour, and knighted by Philip IV. After finally returning to his own country he married, was made burgomaster of Deventer, and died in 1681. The subjects which Terburgh generally painted were portraits, conversations, persons engaged at different games, performers on musical instruments, ladies at their toilets, &c. Many of his capital works are in England.

TERCEIRA. [AZORES.]

TEREBINTA'CEÆ, a natural order of dicotyledonous plants. They are trees or shrubs, abounding in a resinous, gummy, caustic, poisonous, and sometimes milky juice. This order was constituted by Jussieu, and is adopted by De Candolle, Arnott, Don, and other writers on systematic botany.

TERED'O, the name given by Linnæus to a genus of testaceous mollusks, highly interesting on account of the ravages which one of the species commits upon submerged wood.

It is now more than 40 years since Sir Everard (then Mr.) Home laid before the Royal Society, with the assistance of Mr. Clift in making the drawings, and the aid of Sir Benjamin (then Mr.) Brodie, his 'Observations on the Shell of the Sea-Worm found on the Coast of Sumatra, proving it to belong to a species of Teredo, with an account of the Anatomy of the Teredo Navalis.' Sir Everard remarks that the internal structure and economy of *Teredines* were so little known, that it became necessary to acquire an accurate knowledge of the common *Teredo navalis*, before any adequate idea could be formed of the new species, which he names *Teredo gigantea*.

On examining the shell of *Teredo navalis* while in the wood, Sir Everard found its external orifice very small, just large enough, in fact, to give a passage to the two small tubes. The greatest thickness observed was $\frac{1}{24}$ of an inch. The canal in the wood at its termination, and for an inch in length, was not lined with shell, but smeared over with a dirty green-coloured mucus, which was also spread upon the last-formed portion of shell. According to Mr. Hatchett's analysis, the shell of *Teredo navalis* was perfectly similar to that of *Teredo gigantea*, being devoid of phosphate of lime, and composed of 97 parts of carbonate of lime and 3 of animal matter.

While the animal was in the shell alive and undisturbed, what is termed the head was in contact with the end of the canal in the wood; but, on laying the head bare it was drawn in for an inch into the shell. The body of the animal filled the area of the shell completely, but appeared much smaller when taken out, in consequence of the sea-water which it contained having escaped. The largest of the worms examined, which were of different lengths, measured 8 inches in length. Many of them were alive 24 hours after being

removed from their shell, and in these the heart was seen to palpitate. The blood in the vessels going to the head was red, as also the parts near the liver; but this colour disappeared soon after death.

The head of the worm was enclosed between the two concave boring shells, so that what Sir Everard calls the face was the only part exposed. These shells were united together on what is termed the back part of the head by a very strong digastric muscle, having a middle tendon from which the fibres go off in a somewhat radiated direction, partly for insertion into the concave surface of each shell, and partly into a long semicircular process projecting from the posterior part of each shell. The two enclose the œsophagus and other parts surrounding it. The double muscle was enclosed in a smooth shining fascia. When first exposed it was of a bright red.

On the opposite side of the head the shells were united by a ligament from which they were readily separated; at this part were two small tooth-like processes, one from the narrow edge of each shell, where they were joined together.

From the middle of the exposed part of the head projected a kind of proboscis; which in the living animal had a vermicular motion: its extremity was covered by a cuticle not unlike the cornea of the eye. On removing this, the cavity immediately beneath it was found to contain a hard brown-coloured gelatinous substance, in form like a Florence flask, with the large end uppermost. ' Sir Everard remarks that as this proboscis has no orifice, there is reason to believe that it adheres to the wood, acting as a centre-bit, while the animal is at work with the shell, and thus the canal in the wood is perfectly cylindrical. The mouth was nearly concealed by the projection of the proboscis, but, when exposed, presented a very distinct round orifice between the proboscis and the large digastric muscle.

' The body of the worm,' proceeds Sir Everard, ' is inclosed in one general covering, extending from the base of the boring shell, with which it is firmly connected, to the root of the two small tubes, which appear out of the wood. It terminates in a small double fold forming a cup, on the inside of which are fixed the long small stems of two opercula, which become broad and flat towards their other extremity. These, when brought together, shut up the shell, and inclose the two contracted tubes within it: not one operculum corresponding to each tube, but in a transverse direction. In the *Teredo gigantea*, the opercula are similarly situated, each shutting up one-half of the bifurcation. At the base of this cup the general covering is thick and ligamentous, for about one-fourth of an inch in length, where the stems of the opercula are connected with it; and at one spot of this thickened part there is an adhesion to the cylindrical shell, which is the only part of the animal connected with it. There is a depression in the shell pointing out this spot. The double fold of the outer covering, that forms the cup, contains the sphincter muscle, which closes the orifice by bringing the opercula together. The general covering is composed of two membranes, the outer the strongest, and made up of circular fibres, the inner much finer, having no fibrous structure. On the back of the animal, this covering is firmly connected to the parts underneath, and is there strongest. On the belly it forms a cavity, and is thinner. It is everywhere sufficiently transparent to show the different viscera through it.'

With respect to the habits of this remarkable group of boring mollusks, the following points are worth notice:—Some of the *Teredines* examined by Sir Everard Home were sent from Sheerness in the wood alive, and they lived in salt-water for three days after being brought to town. Sir Everard observed that when the surface of the wood was examined in a good light, while only an inch in depth in the water, the animal threw out sometimes one, at others two small tubes. When one only was protruded, the other almost immediately followed it. One of them was about three-quarters of an inch long; the other only half that size. When the largest was exposed to its full extent, there was a fringe on the inside of its external orifice of about twenty small tentacula, scarcely visible to the naked eye: these were never seen except in that state; for when the tube was retracted the end was first drawn in, and so on, until the whole was completely inverted: and therefore, in a half-protruded state, it appeared to have a blunt termination with a rounded edge. The smaller tube was not inverted when drawn in. 'These tubes,' says Sir Everard Home, in continuation, 'while playing about in the water appeared at different times to vary in their directions, but usually remained at the greatest convenient distance from each other. The largest was always the most erect, and its orifice the most dilated; the smaller one was sometimes bent on itself, with its point touching the wood. In one instance, where a small insect came across the larger one, the point of the smaller turned round and pushed it off, and then went back to its original situation. In several instances the smaller one appeared to be the most sensible; since by touching the larger one gently it did not retract, but on touching the smaller one they both were instantly drawn in. Indeed, whenever they were retracted, they always were drawn in together. When the worm was confined within the shell the orifice was not to be distinguished in the irregular surface of the wood, which was covered with small fuci. The worm appears commonly to bore in the direction of the grain of the wood, but occasionally it bores across the grain to avoid the track of any of the others; and in some instances there was only a semitransparent membrane as a partition between two of them.'

Sir Everard observes that as the *Teredo gigantea* bores in mud, on which it cannot be supposed to subsist, or even to receive any part of its nutriment from it, it becomes a question whether the *Teredo navalis*, an animal of much smaller size, derives support from the wood which it destroys, or is supplied wholly from the sea. The last opinion seems the most probable to Sir Everard, because the animal, having red blood and very perfect organs, necessarily requires a great deal of

nourishment for the purposes of growth, and to supply the waste constantly going on; but if, he observes, the aggregate of shell and animal substance is taken, it will be found equal in bulk, and greater in specific gravity than the wood displaced in making the hole: hence, he remarks, it is obvious that the quantity of wood which the animal has taken into its body is wholly insufficient for its formation and subsistence. When once it is established that the *Teredo* can be supported independently of the wood which is eaten, and can afterwards subsist when the communication between it and the wood is cut off, a doubt, he adds, is created about the wood forming any part of its aliment, and it becomes probable that the *Teredo navalis*, like the *Teredo gigantea*, forms its habitation in a substance from which it receives no part of its sustenance; and that the sawdust conveyed through the intestines is not digested, particularly as that examined by Mr. Hatchett had not undergone the slightest change.

It is said, probably with truth, that *Teredo navalis* was introduced into Europe from warmer climates. However that may be, it now unfortunately swarms in our seas. The ravages of this apparently insignificant animal are terrible. Ships, piles, all submarine wood-works, are ruinously affected by it: small as it is, it threatened the submersion of Holland by its destruction of the dykes. The living specimens which formed the subject of Sir Everard Home's observations were furnished from one of the royal dockyards. The rapidity of its growth and the destructive celerity with which it works are hardly credible. A piece of deal, after a submersion of forty days, was riddled by them, and some had attained considerable size. Those from the dockyard at Plymouth, examined by Montagu, were in piles which had been recently taken up to be replaced with new; they had not, according to the information given to Montagu, been under water above four or five years, yet they were greatly perforated, though they were sound solid oak when they were driven. The only effectual way of preventing the attacks of this animal upon piles appears to be by covering all that part which is continually beneath the surface with short broad-headed nails. The action of the sea-water on the nails produces a strong coating of rust, said to be superior to a copper sheathing.

TERENTIANUS MAURUS. [MAURUS, TERENTIANUS.]

TERENTIUS, or more fully P. TERENTIUS AFER, was one of the two comic poets of Rome whose works have come down to us. The facts of his life were matter of dispute even among the Romans themselves. The story is that he was born at Carthage, and became the slave of Terentius Lucanus, a Roman senator who gave him a good education and afterwards manumitted him. At Rome he lived on terms of intimacy with the second Scipio Africanus and his friend Lælius, who were even said to have assisted in the composition of the six comedies which bear the name of Terence. Before he had completed his thirty-fifth year he left Rome, and he never returned. St. Jerome places his death in the reign of Ptolemæus Philométor, who died in the third year of the 158th Olympiad, or the close of 146 B.C.

Terence acknowledges in the titles to his plays his obligations to the Greek comedians Menander and Apollodórus; but he was not a mere translator, for one of the charges brought against him was that he drew the materials of a single play from two or more of the Greek plays. He was much and deservedly admired by his countrymen, especially by Cicero. From Plautus, with whom alone we can now make any satisfactory comparison, he differs most widely. Though Plautus excelled in powerful but ludicrous expressions, he was altogether deficient in the formation and development of a plot. Terence, on the other hand, though even he occasionally introduces the buffoonery of the 'miles gloriosus,' the 'parasitus,' and the 'currens servus,' to gratify the prejudices of his more unpolished hearers, who were better able to appreciate the merits of a boxer or a rope-dancer, still deserves our admiration for his efforts to place before his countrymen the comedy of manners. If he was not always successful, the failure was due to the rude minds of his spectators and the magnitude of a Roman theatre, and perhaps also to the use of masks, which, if always used, must have been a serious obstacle to the best efforts of the comic actor. The best edition of Terence is that of Bentley, Amsterdam, 1727. The modern imitations of Terence may be seen in Dunlop's 'Roman Literature.' George Colman has translated the comedies of Terence into English blank verse. There are French translations by Madame Dacier and Le Monnier.

TERENTIUS CLEMENS, a Roman jurist, whose period is uncertain, but he lived after Julianus, or was at least his contemporary, for he cites him. ('Dig.,' 24, tit. 6, s. 6.) He wrote twenty books 'Ad Legem Juliam et Papiam,' from which there are some excerpts in the Digest. He is not cited by any jurist in the Digest.

TERM (Algebra). A simple term in an algebraical expression means all that involves multiplication, division, and extraction of roots, without addition or subtraction. Thus in the expression

$$a^2b^3x^2 - 2abx^3 + \sqrt{ab}\,.\,x^4,$$

the terms are $a^2b^3x^2$, $2abx^3$, and $\sqrt{ab}\,.\,x^4$.

TERM. The Law Terms are those portions of the year during which the courts of common law sit for the despatch of business. They are four in number, and are called Hilary Term, Easter Term, Trinity Term, and Michaelmas Term: they take their names from those festivals of the Church which immediately precede the commencement of each. The statute which now determines them is the 11 Geo. IV. & 1 Wm. IV., c. 70, amended by 1 Wm. IV., c. 3, which enacts that Hilary Term shall begin on the 11th and end on the 31st of January; Easter begin on the 15th of April and end on the 8th of May; Trinity begin on the 22nd of May and end on the 12th of June; Michaelmas begin on the 2nd and end on the 25th of November. Monday is in all cases substituted for Sunday when the first day of Term falls on Sunday. During Term four judges sit in each court, and are occupied in deciding pure matters of law only, without the intervention of a

jury. The fifth judge in each court sometimes sits alone to determine matters of smaller importance or to try causes at Nisi Prius. By the statute 1 & 2 Vict., c. 32, the courts of common law are empowered, upon giving notice, to hold sittings out of Term for the purpose of disposing of the business then pending and undecided before them. These sittings are conducted in the same manner as those during the Term, except that no new business is introduced. The period during which they have the power to do this is restricted to 'such times as are now by law appointed for holding sittings at Nisi Prius in London and Westminster.' These times are appointed by 1 Wm. IV., c. 70, s. 7, and consist of 'not more than twenty-four days, exclusive of Sundays, after any Hilary, Trinity, and Michaelmas Term, nor more than six days, exclusive of Sundays, after any Easter Term, to be reckoned consecutively after such Terms.' The judges are also empowered by the same section to appoint such day or days as they shall think fit for any trial at bar (that is, a trial before four judges of the court), and the time so appointed, if in vacation, is for the purposes of the trial to be deemed a part of the preceding Term.

There is also a provision which enables the judges, with the consent of the parties, to appoint any time not within the twenty-four days for the trial of any cause at Nisi Prius. The sittings during these twenty-four and six days are called the sittings after Term, and are held for the trials of causes at Nisi Prius for London and Westminster, which places do not form part of any of the circuits. Sittings at Nisi Prius are also held for the same purpose before single judges during Term time, but no special jury cases are taken within the Term.

TERM OF YEARS signifies the estate and interest which pass to the person to whom an estate for years is granted.

TERMINALIA. [TERMINUS.]

TERMINA'LIA (from *terminus*) is the name of a genus of plants belonging to the natural order *Combretaceæ*. All the species are inhabitants of the tropical parts of Asia and America: they are numerous, and many of them are used in medicine and the arts. *T. angustifolia*, Narrow-Leaved Terminalia, is a native of the East Indies, and was formerly called Terminalia Benzoin, as it yields on tapping a gum-resin very similar to benzoin, and possessing the same properties. *T. vernix*, Varnish Terminalia, is a native of the Moluccas, and abounds in a resinous juice, which is collected by the inhabitants, and used in the natural state as a varnish. It is also used for the same purpose in China. *T. Catappa* was originally a native of the East Indies, but has now become naturalised in the West India Islands. The bark and leaves yield a black pigment. The timber is light, durable, and much used. *T. glabrata*, Smooth Terminalia, is a native of the Society and Friendly Islands, and is cultivated by the inhabitants near their huts and in their burial-places. The wood is used in these islands for building boats, making benches, &c., and the seeds are eaten. *T. Bellerica*, Belleric Terminalia, is a native of mountainous districts of the East Indies. Its flowers are very fetid. *T. Chebula* is also an East Indian species. The fruit of this species is astringent, and is used for the purposes of dyeing. Both this species and the last are subject to the attacks of insects producing gall-nuts. These galls possess the astringent principle in abundance, and are also used for dyeing.

TE'RMINUS, a Roman deity whose worship was said to have been introduced by King Numa Pompilius, when he ordered the fields of the citizens to be separated from one another, and the boundaries to be marked by stones which were to be considered as sacred to Terminus. The *Terminalia*, or festival of Terminus, was celebrated at Rome annually on the 23rd of February. Besides the private Terminalia, there were the public Terminalia, which were solemnised in a similar manner by the whole people on the boundary of the Ager Romanus (Ovid., 'Fast.,' ii. 679, &c.).

TERMINUS, or TERM, signifies, in sculpture and architecture, a pillar statue, that is, either a half statue or bust, not placed upon, but incorporated with and as it were immediately springing out of the square pillow which serves as its pedestal. If they be mere busts, figures of this kind are usually distinguished by the name of Hermæ (Ἑρμαῖ); and busts which, instead of having a circular moulded base, resemble the upper part of a terminus, are called terminal busts.

In architectural design *Terms* are employed in lieu of Caryátides, not however as insulated pillars, but as pilasters forming a small order or attic, or a decoration to gateways, doors, &c. They frequently occur in what is called the Cinquecento and our own Elizabethan style.

Terminus is also now used to signify the buildings for offices, &c., at the extremity of a railroad, whereas those erected at intervals along its course are called *Stations*. The establishment of railroads has thus given rise to a new class of structures, which from their nature and extent admit of being rendered very striking in character and design, and in many instances are so.

TERMITI'NÆ, a section of Neuropterous insects, in which Latreille includes the genera *Mantispa*, *Raphidia*, *Termes*, and *Psocus*. These genera however are usually regarded as constituting three distinct families, into the distinguishing characters of which we shall not here enter. We spare a little space however for an observation or two on the Termite Ants (*Termes*).

The Termites, or White Ants, as they are often called, though they have little affinity with the true ants, are chiefly confined to the tropics; some few species however extend into the temperate regions. Like the bees, wasps, and ants, which live in society, the Termites are composed of three kinds of individuals, males, females, and what are termed neuters or workers. Their ravages in the warmer parts of the globe are well known. They unite in societies composed each of an immense number of individuals, living in the ground and in trees, and often attacking the woodwork of houses; in which they form innumerable galleries, all of which lead to a central point. In forming these galleries they avoid piercing the

surface of the wood-work, and hence it appears sound when the slightest touch is sometimes sufficient to cause it to fall to pieces.

The termites sometimes erect their domiciles on the ground in the form of pyramids or cones, sometimes with a roof, and these nests are often very numerous, and resemble the huts of savages.

The larvæ nearly resemble the perfect insect, excepting that they possess no wings. The pupæ have rudimentary wings. The neuters differ from the males and females in possessing no wings, in having the body stouter, the head much longer, and provided with long jaws crossing at the extremity. They are said to defend the nests, and stationing themselves near the outer surface, they are the first to make their appearance when their habitation is disturbed: they will attack the party molesting them, and bite with considerable strength.

The negroes and Hottentots consider these insects a great delicacy. They are destroyed with quick-lime, or more readily with arsenic, which is thrown into their habitations.

TERMS, ATTENDANT and SATISFIED. The assignment of satisfied terms on the purchase of property was frequently accompanied by great difficulty and expense. In the 8 & 9 Vict. an act was passed intituled 'An Act to render the assignment of Satisfied Terms unnecessary.' It provided that every satisfied term on the 31st December, 1845, attendant upon the inheritance, should on that day cease, except that such term, although thus made to cease, should afford the same protection as if the same still subsisted, but had not been dealt with after the 31st December, 1845. And, by s. 2, that every term of years subsisting or after created, and becoming satisfied after the day mentioned above, and which should after that day become attendant on the inheritance, should immediately on becoming so attendant cease and determine.

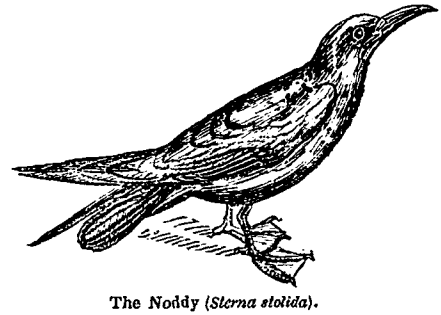
With respect to the provisions of this act all must admit that they are beneficial. The principle that by a subtlety a subsequent purchaser might obtain a priority over a prior bonâ fide purchaser was unjust, and would only have been resorted to by judges if the legislature had not left the laws of property in an incomplete state. This device of assignments of outstanding legal interests was but a clumsy and imperfect substitute for a general registry, with this addition, that it protected one innocent purchaser at the expense of another.

TERN, *Sterna*, the name of those web-footed long-winged birds which are vulgarly known as *Sea-Swallows*.

Cuvier arranges the *Hirondelles de Mer* between the *Gœlands* (*Larus*) and *Rynchops*. He observes that these *Hirondelles de Mer* derive their names from their excessively long and pointed wings, their forked tail, and their short legs, which give them a port and flight analogous to those of the Swallows. Their bill, he adds, is pointed, compressed, straight, without curvature or projection; their nostrils, situated towards the base, are oblong and pierced through; the membranes which unite their toes are very much notched, they therefore swim but little. They fly in all directions, and with rapidity over the sea, uttering loud cries and cleverly picking up from its surface the mollusks and small fishes which form their food. They also advance inland to lakes and rivers.

Geographical Distribution.—The Terns are widely diffused over the maritime parts of the globe. [LARIDÆ.] The following have occurred, some occasionally only, in Europe:—

The Caspian Tern, *Sterna Caspia* (genus *Stylochelidon*, Brehm); the Sandwich Tern, *Sterna Cantiaca* (genus *Thalasseus*, Boie); the Gull-Billed Tern, *Sterna Anglica* (genus *Gelochelidon*, Brehm); the common Tern, *Sterna Hirundo* (genus *Sterna* of authors); the Roseate Tern, *Sterna Dougallii* (genus *Sterna*); the Arctic Tern, *Sterna Arctica* (genus *Sterna*); the Little Tern, *Sterna minuta* (genus *Sternula*, Boie); the Noddy, *Sterna stolida* (genus *Anous*, Leach;



The Noddy (*Sterna stolida*).

Megalopterus, Boie); the Black Tern, *Sterna nigra* (genus *Hydrochelidon*, Boie; *Viralva*, Leach); the White-Winged Tern, *Sterna leucoptera*; and the Moustache Tern, *Sterna leucopareia*. Of these the largest is the Caspian Tern.

TERNATE, an island in the Indian Archipelago, is traversed by 50′ N. lat. and 127° 20′ E. long. It is 10 miles long and 4 or 5 wide. The greater part of the island appears to be occupied by a volcano about 4000 feet in height; the remainder is very fertile, and affords rice and the other productions of the Indian Archipelago. The inhabitants are Malays, who have embraced Mohammedanism. There are three mosques. The king possesses also the northern part of Gilolo, and the north-eastern limb of Celebes, where the Dutch have two settlements at Manado and Gurontalu, and several of the adjacent islands.

Ternate was first visited by the Portuguese in 1521, and some years afterwards they formed a settlement, which passed into the hands of the Dutch in 1606; who, in 1680, reduced the king to a state of dependence on them, and enlarged their establishment. In 1797 it was taken, together with Amboyna, by the English, who restored it at the peace in 1801: it was again taken in 1810, and again given up to Holland by the treaty of Paris in 1814.

TERNI. [SPOLETO.]

TERNSTROMIA'CEÆ, a natural order of plants belonging to the Calycose group of polypetalous Dicotyledons. This order includes the

genus *Thea*, and hence is one of great economical importance. [THEA.] It also includes the genus *Camellia*.

TERPA'NDER, the earliest and the most important historical personage in the history of Greek music and its connection with poetry, for he was both a musician and a poet. He was a native of Antissa, in the island of Lesbos, and his best period falls in the latter half of the seventh century before Christ. In B.C. 676, at the first celebration of the musical contests during the festival of the Carneia near Sparta, Terpander was crowned as victor. He afterwards gained four successive prizes in the musical contests at the Pythian games.

Numerous musical inventions are said to have been made by Terpander; but of many of his inventions we are unable to form any clear idea. The most important is the seven-stringed cithara (heptachord). His poetical compositions are lost, with the exception of a few fragments.

TERPSI'CHORE. [MUSES.]

TERRA DI LAVORO. [LAVORO, TERRA DI.]

TERRACI'NA, a seaport town in the Papal province of Frosinone, midway between Rome and Naples, has about 6000 inhabitants. The old town, which is built on the site of the ancient Anxur, rises in the form of an amphitheatre on the slope of a calcareous rock, leaving but a narrow strip of land between it and the sea, along which runs the high road from Rome to Naples in the track of the ancient Via Appia. Along the road are the modern buildings of Terracina, constructed by Pius VI., and consisting of the post-house and inns, custom-house, granaries, and other structures for public use. The old harbour, which was restored by the Emperor Antoninus, has been long since filled up, but remains of the mole are still seen. The old town is an assemblage of poor-looking houses, perched one above another, surrounded and overtopped by white cliffs which are seen from afar (Horace, 'Sat.' I., i. 5), and intermixed with myrtle, orange, and palm trees, and with plants of aloes and cactus. Above all rise the cathedral with its lofty steeple; an elegant palace built by Pius VI.; the remains of the palace of Theodoric, which is a structure of the fifth century, situated on the summit of the hill, and about 600 feet above the sea; and an old castle raised in the middle ages. The cathedral is ornamented with some fine fluted Corinthian columns, which have been taken from a temple of Jupiter now ruined. Remains of a theatre are also seen. The climate of Terracina is very mild and genial in winter, but unwholesome in summer.

Anxur, a thriving town of the Volsci long before the Roman conquest, was taken by the Romans in the year 403 B.C., retaken by surprise in 399, and taken again by the Romans three years after. It afterwards became a Roman colony by the name of Tarracina.

TERRANOVA. [SICILY.]

TERRIER, from the French word *terrier*, a land-book, a register or survey of lands.

TERRIER (*Canis familiaris Terrarius*), a variety of the dog remarkable for the eagerness and courage with which it goes to earth, and attacks all those quadrupeds which come under the gamekeeper's denomination of *Vermin*, from the Fox to the Rat.

TERTIARY STRATA. [GEOLOGY, vi., 594.]

TERTULLIA'NUS, QUINTUS SEPTIMIUS FLORENS, the earliest of the Latin ecclesiastical writers, lived in the latter part of the second century and the beginning of the third. The exact date of his birth is unknown; Tillemont supposes that it was in 160 A.D., and others have fixed it as early as 135. He was born, according to Jerome, at Carthage. He embraced the profession of an advocate or rhetorician, in which he appears to have attained to some eminence. During this period of his life he was a heathen, as he himself informs us ('Apolog.,' 18). He was converted to Christianity at Carthage in all probability, and upon his conversion he was ordained a presbyter. About the end of the second century he became a Montanist. [MONTANISTS.] In his writings composed before his Montanism he shows many traces of that zeal and asceticism which formed the peculiar characteristic of the Montanists. It has been doubted whether he remained a Montanist to his death. But whether he remained a Montanist or not he continued to be held in the greatest respect by the African churches. In fact it is to his influence that we must trace the characteristics which distinguished these from other Christian churches, and which at length, through Augustin, gave a tone to the Christianity of the West. His influence was especially great upon Cyprian, in whose writings there is much which closely resembles some of Tertullian's. The time of Tertullian's death is unknown, but we are told by Jerome that he lived to a great age. One of his works ('Ad Scapulam') was written as late as 216 A.D.

A large portion of his works have come down to us, and these may be divided into three classes: (1) apologetic, (2) practical, and (3) doctrinal or controversial. The same classification is sometimes stated differently, as follows:—(1) writings against the heathen; (2) writings on the nature, morals, rites, &c., of the church; and (3) writings against heretics. It is important to distinguish, if possible, between the works which he wrote before he became a Montanist and those which he wrote afterwards. A few writers have thought that all the works of Tertullian were composed after he adopted the opinions of Montanus. A list of the numerous works of Tertullian is given in the article 'Tertullianus' in the 'Penny Cyclopædia.' Tertullian holds one of the first places, if not the very first, among the Latin fathers for learning and intellectual power. Even those to whom his peculiar opinions were the least acceptable have eulogised him in the highest terms. Thus Jerome says ('Epist.' lxx., sec. 5), 'What more learned, what more acute than Tertullian? whose apology and books against the heathen embrace all the learning of the age.' Erasmus calls him 'by far the most learned of all the Latin theologians.'

His excellencies and defects are strangely mingled. We trace the skill of the rhetorician in his forcible reasonings and his eloquent style, but he has also the rhetorician's faults in arguing often

with more sophistry than truth, and in taking liberties with language till his meaning becomes obscure. His warm and zealous temper gives life and impressiveness to his writings; but its excess made him an enthusiast and ascetic, perhaps we ought in truth to say a fanatic. His eloquence is often inflated and obscure. He indulges frequently in figures and hyperboles, and excels in satire and irony. His polemical works are the clearest, but not the most elegant. His best works are his Apology, and those on the Prescription of the Heretics, on Repentance, on Baptism, on Prayer, on Patience, and his address to Martyrs.

The best editions of Tertullian are those of Rhenanus, Rigaltius, and Semler. There is an excellent edition of Tertullian by Leopold, in Gersdorf's '*Bibliotheca* Patrum Ecclesiasticorum *Latinorum* Selecta,' 4 vols. 12mo., Leipz., 1839–41, Tauchnitz.

It is doubtful whether the Tertullianus, or Tertyllianus, from two of whose works there are excerpts in the 'Digest,' is this Tertullianus. The subject is briefly discussed by Zimmern ('Geschichte des Röm. Privatrechts'). In his theological works Tertullian shows that he was well acquainted with the Roman law.

TERVUREN. [Brabant, South.]

TESCHEN. [Moravia; Silesia, Austrian.]

TE'SSERA, a small cube or square resembling our dice, which was used by the ancients for various purposes, and formed of different materials, as marble, precious stones, ivory, glass, wood, or mother-of-pearl. Such small tesseræ of different colours were used to form the mosaic floors, or pavements in houses, which were hence called *tesselata pavimenta*. (Sueton., 'Cæsar,' 46.) The same kinds of cubes were used by the ancients as dice in games of hazard, just as in our times.

TESSIN. There are three eminent Swedes of this name, father, son, and grandson.

Nicodemus Valentinson Tessin was born at Stralsund in 1619, and held the appointment of royal or crown architect. Very little more has been recorded of him, except that he visited Italy, that a patent of nobility was granted to him in 1674 by Charles XI., and that he filled the office of magistrate at Stockholm. As an architect one of his chief works is the palace of Drottningsholm, begun by him for the queen-dowager Hedwig Eleonora (widow of Charles Gustavus), but completed by his son. He also erected the royal villa of Strömsholm, and the mausoleum of Charles Gustavus. He seems to have died about 1688.

Count Nicodemus Tessin, son of the above, was born at Nyköping in 1654. He was educated first at Stockholm, afterwards at Upsala, and then studied architecture at Rome under Bernini. He next visited Naples, Sicily, and Malta, and again returned to Rome, at which place he received from Sweden his appointment as court-architect in 1689. After visiting England and France, he finally settled in his native country. The destruction of the royal palace by fire in 1697 afforded him an opportunity of which he so well availed himself as to render the new edifice one of the noblest of its kind in Europe. In addition to his professional occupations, which were many and various, the Count (which title was conferred upon him in 1714) took a considerable share in public and political affairs. At the time of his death (1728) he was chancellor of the university of Lund.

Count Charles Gustavus Tessin, the son of Count Nicodemus, was born at Stockholm in 1695. It was as a statesman and diplomatist that he chiefly distinguished himself. He was ambassador at the court of France from 1739 to 1742, and president of the chancery from 1747 to 1752. As tutor to the prince-royal, afterwards Gustavus III., he wrote for his instruction a series of letters on political and moral topics, which were published. Count Gustavus was a zealous promoter of every scheme for the advancement of his country. He first established the Swedish Academy for Painting and Sculpture in 1735. He died in 1771; and by his death the family became extinct.

TESTACE'LLUS, the name of a genus of testaceous pulmoniferous Mollusks, resembling the Slug, of which one species is now not uncommon in our island. The rudimentary shell is on the posterior dorsal portion of the animal.

Mr. G. B. Sowerby describes three species, viz. *T. haliotideus*, a native of the south of France; *T. Maugei*, an inhabitant of Teneriffe, now common in the neighbourhood of Bristol, and also in the gardens around London; and *T. scutulum*, discovered by Mr. Sowerby in a garden at Lambeth, and which perhaps is indigenous in Great Britain. Food, earth worms and vegetable matters.

TESTAMENT. [Will and Testament.]

TESTAMENT, OLD AND NEW. Some critical disputes have arisen respecting the meaning of the word *Testament*, as applied to the Holy Scriptures. The word thus translated by *Testament* is the Hebrew *berith*, which is used in the sense of *covenant* in the first division of the sacred writings, and rendered in the latter by the Greek *diathéke*. But a further notion than that conveyed by the Hebrew is contained in the Greek term, and also in its Latin representative *Testamentum*, which is the original of the ordinary designation of the two portions of the Scriptures, the *Old* and *New Testaments*. No more appropriate designation than that of *New Testament* can be applied to the second portion. Its application to the books of the Old was defended by St. Jerome on the ground that 'Testamentum non voluntatem defunctorum sonat, sed pactum viventium' (*Testamentum* means not the will of the dead, but a covenant between the living).

TESTE-DE-BUCH. [Gironde.]

TESTELIN, or TETTELIN, LOUIS, was born at Paris in 1615, and was a pupil of Vouet. He was one of the original members of the French Academy at its establishment in 1648. In 1650 he was appointed one of the professors of the academy. Two of his most celebrated pictures, the Resurrection of Tabitha by St. Paul, painted in 1652, and the Flagellation of St. Paul and Silas, painted in 1655, the year of his death, are in the church of Notre Dame.

TESTIMONY, PERPETUATION OF. [Perpetuation of Testimony.]

TESTONE. [MONEY.]

TESTS, CHEMICAL, or Chemical Re-agents, are those substances which are employed to detect the presence of other bodies, by admixture with which they are known to produce certain changes in appearance and properties.

TESTU'DO. [TORTOISES.]

TE'TANUS (τέτανος, derived from τείνω, *to stretch*) is both a generic and a specific term: generically it may be defined to be a more or less violent and rigid spasm of many or all of the muscles of voluntary motion: the name is also applied to one of the species of this affection. Both the disease and also its name are as old as the time of Hippocrates; and, as it is proved by experience to be much more frequent in warm climates, the ancient physicians probably had peculiar advantages in observing it.

There are three forms of tetanic convulsions: the straight, the backward, and the forward. The straight one is true *Tetanus*, when the patient is stretched straight and inflexible; the backward or forward varieties have their name from the direction and locality of the tension: hence the deflexion of the patient backwards is termed *opisthótonos* (ὀπισθότονος), from the nerves being affected in this direction; while, if the bending be forward, by the nerves in front, it is termed *emprosthótonos* (ἐμπροσθότονος), for *tonos* (τόνος), is a term which signifies both *a nerve* and *tension*. This disease is also divided into *traumatic*, or that arising from a wound, which is also occasionally termed *symptomatic;* and into *idiopathic*, or that which proceeds from other causes.

Traumatic Tetanus sometimes comes on in a surprisingly sudden manner, and quickly attains its most violent degree. The most rapidly fatal case that has ever been recorded is one that we have on the authority of the late Professor Robison of Edinburgh. It occurred in a negro, who scratched his thumb with a broken china plate, and died of tetanus a quarter of an hour after this slight injury. Most commonly however the approaches of the disorder are more gradual, and it slowly advances to its worst stage. In this sort of case the commencement of the disorder is announced by a sensation of stiffness about the neck, a symptom which, increasing by degrees, renders the motion of the head difficult and painful. In proportion as the rigidity of the neck becomes greater, the patient experiences in the throat a sense of dryness and soreness, and about the root of the tongue an uneasiness, soon changing into a difficulty of mastication and swallowing, which after a time become totally impossible. The attempt at deglutition is attended with convulsive efforts, especially when an endeavour is made to swallow liquids; and so great is the distress which accompanies these convulsions, that the patient becomes very reluctant to renew the trials, and occasionally refuses all nourishment; sometimes it even inspires him with a dread of the sight of water, and a great resemblance to hydrophobia is produced.

Next in frequency to wounds as an exciting cause of tetanus is exposure to cold and damp; indeed there are but very few cases of true Idiopathic Tetanus which are referrible to any other. The predisposition to tetanic affections is given, in the first place, by warm climates and warm seasons. Within the tropics therefore it prevails to an extent unheard of in colder latitudes. Secondly, tetanus is chiefly observed to prevail when the atmosphere is much loaded with moisture, and particularly where this has suddenly succeeded to a long course of dry and sultry weather. Even in this country exposure to the cold and damp air of the night has occasionally been followed by an attack of tetanus. In tropical climates children are particularly subject to this complaint, and with a few peculiarities which, though producing no specific difference, have been thought sufficient to constitute a variety known by the name of *Trismus Nascentum*. The disease in this case is vulgarly known by the absurd name of *Falling of the Jaw*. It occurs chiefly between the ninth and fourteenth day after birth, and seldom after the latter period.

The treatment of Tetanus is confessedly a subject of infinite difficulty, as the disease frequently baffles every mode of practice, and, in certain instances, gets well under the employment of the very same remedies which decidedly fail in other similar cases. Upon the whole it may be said that no effectual remedy for Tetanus has yet been discovered, as every plan has occasionally succeeded, and every plan has still more frequently failed.

TETBURY. [GLOUCESTERSHIRE.]

TETRABRANCHIA'TA, Professor Owen's second order of the class *Cephalopoda*. This order is equivalent to the Céphalopodes Testacés Polythalamés of Lamarck, and to the Polythalamacés of De Blainville.

The genera comprised by Professor Owen under this order, in his 'Memoir on the Pearly Nautilus' (1832), are—*Belemnites, Baculites, Lituola, Spirula, Ammonites, Orbulites, Nautilus, Cibicides, Rotalites*, &c.

In the 'Cyclopædia of Anatomy and Physiology' (1836), Professor Owen modifies the views above given. In that work the *Tetrabranchiata* form the first order of the *Cephalopoda*, with the following synonyms: *Polythalamacés*, Blainville; *Siphonifera*, D'Orbigny; minus the *Spirulidæ* and *Belemnites*.

TETRACHORD, the Greek name for any part of the scale consisting of four notes, the highest of which is a perfect fourth to the lowest. Thus in the common diatonic scale we have the following tetrachords:—

CDEF, DEFG, EFGA, GABC, ABCD, BCDE.

All parties seem agreed that the Greek scale, which at first consisted of only two or three leading consonances, was gradually enlarged until it comprehended two octaves, or fifteen notes. It is generally stated that this scale, when it was what we now call Diatonic (a word which means the same with us as with the Greeks), was minor in its character, so that in fact it would be represented by

A B C D E F G A' B' C' D' E' F' G' A',

It is also known that the Greeks were early in

possession of the mode of dividing a string so as to produce their several notes; and that, by the time of Ptolemæus at least, they took the rapidity of the vibrations (on which they knew the pitch to depend) to be inversely as the lengths of the strings.

Their scales were numerous. Three were considered classical, if we may use the word, and were called Enharmonic, Chromatic, and Diatonic; the two first words not having the same meaning as with us. The remaining scales had names of locality attached to them, Lydian, Dorian, &c. The distinction between these lay in the different modes of dividing the octave, as seems to be now generally agreed, though there have been those who have thought that these terms, Lydian, &c., were the names, not of scales, but of single notes.

Of enharmonic, chromatic, and diatonic scales, Ptolemæus lays down fifteen from his predecessors, and eight from himself. In each of them is an octave, and all of them agree in two particulars: first, each has the fourth and fifth of the fundamental note perfect; secondly, each has the tetrachord made by the fundamental note and its fourth divided in precisely the same manner as that of the fifth and the octave. That is, if we call the notes of this octave—

C P Q F G R S C';

then CF is a fourth, and CG a fifth, always; and the intervals CP, PQ, QF, are severally equal to the intervals GR, RS, SC'. Thus it appears that the fourth was to the Greeks what the octave is to us, the unit, as it were, of the scale, in the subdivision of which consisted the differences of their systems.

Enharmonic scales seem to have been ancient, and regarded with high approbation.

It seems that the enharmonic system would allow only of the following notes in an octave:—

C E P F G B Q C';

where P means a note about half way between E and F, and Q one half way between B and C. An odd scale truly for a modern musician to look at; but, it may be, not incapable of pleasing effects to ears not accustomed to music in parts.

To make something as like as we can to a Greek chromatic scale, we should write down in modern music

C E♭ E♮ F G B♭ B♮ C'.

The diatonic scales have all so far the modern diatonic character that they divide the tetrachord into two larger intervals followed by a smaller one. As to the other modes, the Dorian, &c., there is much confusion respecting them. According to Wallis they are divisions of the octave, somewhat more fantastic than those which precede. In more recent times the idea has been started of their being simply different keys, or rather answering to different variations of the diatonic scale, by using intermediate semitones instead of some of the notes. It would be difficult, we think, to produce authority enough for this conjecture.

The principal mode of exhibiting the formation of the octave from two tetrachords is

(C D E F) (G A B C').

But it is frequently supposed that it was the following:

C { D E F (G } A B C),

or the following—

A { B C D (E } F G A).

On this point we shall only say that there never was, we believe, so strong a union of the three characters of scholar, mathematician, and musician, as was seen in Dr. Smith, the author of the 'Harmonics.' He had studied the Greek scale attentively, and to him the first of these methods was a matter of course.

The Greek writers were arithmeticians, with a strong determination to find natural foundations in integer numbers: they did not ask how to find sounds which would best suit the ear, but how to discover triplets of fractions which multiplied together should produce four-thirds of a unit. Pleased with the simplicity of the ratios which give the fourth, fifth, and octave, their efforts at musical improvement were confined to the attempt at discovering magic numbers to fill up the intervals. In all probability the musicians, whose object was simply to please, laughed at the arithmeticians.

TETRADY'NAMOUS, a botanical term employed by Linnæus to indicate the character of those flowers which, possessing six stamens, have two of them shorter than the other four. This peculiarity is found exclusively in the plants belonging to the natural order *Cruciferæ*.

TETRAGON (properly a four-angled figure), a term usually applied to the square only, when used, which it seldom is.

TETRAGONIA'CEÆ, a natural order of plants, placed by Lindley in his Curvembryose group of incomplete Dicotyledons. It includes the genera *Tetragonia, Aizoon, Sesuvium,* and *Miltus,* which are generally placed in the order *Ficoideæ* or *Mesembryaceæ*. Like *Ficoideæ,* this order possesses thick succulent leaves, which in many of the species might be used as a substitute for spinach. The *Tetragonia expansa* is a native of New Zealand and Japan. The *Aizoon Canariense* and *A. Hispanicum* grow on the sea-coasts of the Canary Isles and Spain, and are amongst the plants which yield soda after burning.

TETRAGONO'LOBUS, a genus of plants belonging to the papilionaceous division of the natural order *Leguminosæ*. *T. purpureus,* Purple Winged-Pea, is a native of the south of Europe, and has dark purple flowers; a variety is however found with flowers of a dark yellow colour. In southern regions, where this plant grows in perfection, the unripe legumes are cooked, and eaten in the same manner as we eat French beans.

TETRAHEDRON (a term usually applied to the regular tetrahedron) is a pyramid of four triangular faces.

TETRA'NTHERA, a genus of plants belonging to the natural order *Lauraceæ*. *T. Roxburghii* is a variable plant, a native of the mountains of India and China.

TETRAONIDÆ, the Grouse Family of the Order *Rasores* (Gallinaceous Birds). [CAPERCAILLIE; BLACK COCK; BONASIA.]

Mr. G. R. Gray, in his 'List of the Genera of Birds,' arranges the *Tetraonidæ* between the *Phasianidæ* and the *Chionididæ*, with the following subfamilies and genera:—

1. Perdicinæ.

Genera—*Rhizothera*, G. R. Gray; *Ptilopachus*, Sw.; *Ithaginis*, Wagl.; *Lerwa*, Hodgs.; *Pternistes*, Wagl.; *Francolinus*, Briss.; *Chacura*, Hodgs.; *Perdix*, Antiq.; *Arborophila*, Hodgs.; *Coturnix*, Antiq.; *Rollulus*, Bonn.; *Odontophorus*, Vieill.; *Ortyx*, Steph.; *Lophortyx*, Bonap.; *Callipepla*, Wagl.

2. Tetraoninæ.

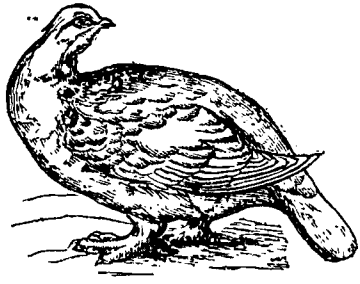
Genera—*Tetrao*, Linn.; *Lyrurus*, Sw.; *Bonasa*, Briss. (*Bonasia*, Bonap.); *Centrocercus*, Sw.; *Lagopus*, Briss.

3. Pteroclinæ.

Genera, *Pterocles*, Temm.; *Syrrhaptes*, Illiger.

European Grouse.

The following species are European:—*Tetrao Urogallus*, the Capercailzie, or Cock of the Wood; *Tetrao hybridus*, Sparrm. (*Tetrao medius*, Meyer), the Hybrid Grouse, once considered by ornithologists to be a hybrid between the Capercailzie and the Black Cock, but now recognised as a genuine species; *Tetrao Tetrix* (genus *Lyrurus*, Sw.), the Black Grouse or Blâck Cock; *Bonasia Europæa*, the Hazel Grouse or Gelinotte; *Lagopus Scoticus*, the Red Grouse; *Lagopus mutus*, the Common Ptarmigan; *Lagopus saliceti*, the



Ptarmigan (*Lagopus mutus*).

Willow Ptarmigan; *Lagopus brachydactylus*, the Short-Toed Ptarmigan; *Pterocles arenarius*, the Sand-Grouse; *Pterocles setarius*, the Pin-Tailed Sand-Grouse.

Of these the Black Cock, the Red Grouse, and the Common Ptarmigan are British; to which we trust that we may now add the Capercailzie, restored by the praiseworthy care of the Marquis of Breadalbane and others.

Of these, some species, as the *Pterocles setarius*, are Asiatic.

The *Pterocles setarius*, or Pin-Tailed Sand-Grouse, is very common on the arid plains of Persia; it is found also in France, on the sterile Landes near the Pyrenees, and along the coasts of the Mediterranean; less common in Provence and Dauphiné; more common in Spain, Sicily, Naples, and throughout the Levant. Temminck, who gives these localities, states, in the fourth part of his 'Manuel,' second edition, that it is common in Provence, in the uncultivated plains of Crau, and

says that it avoids cultured tracts, and only inhabits the sterile Landes of the south; but he adds that it is abundant in the Pyrenees, and that it is to be found all the year round in the markets of Madrid. Mr. Gould states that the species is found in the north of Africa.

Food, Habits, &c.—Seeds, insects, and the young shoots of plants form the food of this sand-grouse: but its wild nature and the barren places which it frequents are adverse to observation; and little or nothing is known of its habits. The nest is a hollow in the earth, and, according to Temminck, the eggs, nearly of the same size at each end, of an Isabella gray, marked with small brown points and large black patches, are only two or three, a small number compared with those of the majority of the *Tetraonidæ*.

African Grouse.

Dr. Andrew Smith remarks, that though we find species of *Pterocles* beyond the confines of Africa, yet the majority of those now known are peculiar to that quarter of the globe. The regions south of the equator, he observes, have furnished nearly as many species as those to the north of it; and he thinks that both will doubtless afford many additional ones when the yet unknown districts shall have been thoroughly explored. Each of the known species, as far as his observations go, has a limited range; and should the range of such as inhabit the unexplored tracts of the interior not be greater, he is of opinion that we may in time expect great additions to the list of known species.

American Grouse.

America possesses several species of grouse, consisting of the genera and subgenera *Bonasia*, *Tetrao*, *Lagopus*, and *Centrocercus*. We have already noticed the Ruffed Grouse [BONASIA], and here select for example *Centrocercus urophasianus*.

This is the *Tetrao urophasianus* of the Prince of Canino, and the *Cock of the Plains* of Lewis and Clark.

Food, Habits, &c.—The favourite food of this species is said to be the pulpy-leaved thorn, but it probably feeds also on buds and berries.

This grouse appears to have been first recorded by Lewis and Clark; and it has since become familiar to the fur-traders on the banks of the Columbia. Dr. Richardson gives the following interesting account of its habits by the late Mr. David Douglas:—

'The flight of these birds is slow, unsteady, and affords but little amusement to the sportsman. From the disproportionately small convex thin-quilled wing—so thin, that a vacant space half as broad as a quill appears between each—the flight may be said to be a sort of fluttering, more than anything else: the bird giving two or three claps of the wings in quick succession, at the same time hurriedly rising, then shooting or floating, swinging from side to side, gradually falling, and thus producing a clapping whirring sound. When startled, the voice is *Cuck, cuck, cuck*, like the common Pheasant. They pair in March and April. Small eminences on the banks of streams are the places usually selected for celebrating the weddings, the time generally

about sunrise. The wings of the male are lowered, buzzing on the ground; the tail spread like a fan, somewhat erect; the bare yellow œsophagus inflated to a prodigious size, fully half as large as his body, and, from its soft membranous substance, is well contrasted with the scale-like feathers below it on the breast, and the flexile silky feathers on the neck, which on these occasions stand erect. In this grotesque form he displays in the presence of his intended mate a variety of attitudes. His love-song is a confused, grating, but not offensively disagreeable tone, something that we can imitate, but have a difficulty in expressing — *Hurr-hurr-hurr-r-r-r-hoo*, ending in a deep hollow tone, not unlike the sound produced by blowing into a large reed. Nest on the ground, under the shade of *Purshia* and *Artemisia*, or near streams, among *Phalaris arundinacea*, carefully constructed of dry grass and slender twigs. Eggs, from thirteen to seventeen, about the size of those of the common fowl, of a wood-brown colour, with irregular chocolate blotches on the thick end. Period of incubation twenty-one to twenty-two days. The young leave the nests a few hours after they are hatched. In the summer and autumn months these birds are seen in small troops, and in winter and spring in flocks of several hundreds. Plentiful throughout the barren arid plains of the river Columbia; also in the interior of North California. They do not exist on the banks of the river Missouri, nor have they been seen in any place east of the Rocky Mountains.' ('Fauna Boreali-Americana.')

Nuttall says that the flesh is dark and less palatable than that of other species.

TETRARCH (*τετράρχης*), from two Greek words, signifying *four* and *to govern*, a title used by the Greeks to designate the ruler of each part of a country which was divided into four parts, either on account of its occupation by different tribes, or merely as a political division. In process of time the title was applied to the rulers of different divisions of the same country, or to the chiefs of different tribes inhabiting the same country, without any reference to the number four. Under the Roman government, in the later times of the republic and under the emperors, there were several such petty princes, independent of each other, but tributary to Rome. They ranked below those other subject princes who were permitted to retain the title of king.

The principal examples of tetrarchies are those of Thessaly, which was anciently so divided, and the division was again made by Philip, the father of Alexander the Great: of Galatia, which was peopled by three Gallic tribes, each of which was divided into four tetrarchies: of Syria, many of the petty princes of which bore the title of tetrarchs, especially certain princes of the family of Herod the Great.

TE'TRICUS, CAIUS PESUVVIUS, a Roman senator, one of the numerous usurpers of the Imperial purple in the third century A.D., who are distinguished in Roman history by the name of the Thirty Tyrants. He was governor of Aquitania, and, after the death of several pretenders in Gaul, was made emperor there, A.D. 268, by Victorina, said to be his kinswoman, and the widow of Victorinus. He reigned for a few years; but after the accession of Aurelian, finding himself unable to control the turbulent and licentious soldiery who sustained his power, he invited the new emperor into Gaul, and pretending to prepare for an engagement near Châlons in Champagne, he betrayed his army into the hands of Aurelian. The triumph of Aurelian, A.D. 274, was ennobled by the presence of Zenobia the queen of the East, and of Tetricus and his son, in the train of captives. The deposed emperor was treated by his conqueror with every mark of distinction during the remainder of his life.

TE'TRODON, a genus of fishes of the order *Plectognathi*. These fishes, instead of having distinct teeth as usual in the class, have the jaws provided with a substance resembling ivory, formed somewhat like the beak of a bird, and fitted for crushing crustaceous animals and fuci, upon which they live. Both the *Tetrodons* and *Diodons* (*Diodon*, Linn.), a very closely-allied genus, have the power of inflating the body with wind, or rather a membrane which extends along the under side of the abdomen, which causes them to float on the surface of the water, without the power, it is said, of directing their course: the membrane, when inflated, gives to the fish an almost spherical form, and is usually defended by spines and prickles. The pectoral fins are rather small; and besides these and the tail-fin, they have one dorsal and a ventral fin. The Diodons have but one large tooth above and below, and are usually protected by large strong spines. The Tetrodons are distinguished by the possession of four large teeth, the jaws being each divided by a central suture. These fishes are confined to the seas of warm climates: some of them are called Globe-Fishes.

TETUAN. [MAROCCO.]

TEU'CRIUM, the name of a genus of plants belonging to the natural order *Lamiaceæ* or *Labiatæ*. *T. Scorodonia*, Wood Germander, or Sage, is a native of Europe in woody hilly situations, where the soil is dry and stony. It is not an uncommon plant in Great Britain. The smell and taste of this plant resemble very much the hop. In Jersey, where it called *Ambroise*, the inhabitants use it as a substitute for hops in their beer; and by some persons the bitter given by the Germander is preferred to that of the hop. *T. Scordium*, Water Germander, is a rare plant in Britain. Its fresh leaves are very bitter and rather pungent, having a smell similar to garlic. *T. Chamædrys*, Wall or Common Germander, is a native of Europe and some parts of Asia, on walls and rocks and dry places. It is only rarely found in Great Britain. *T. Marum*, Cat-Thyme, is a native of the region of the Mediterranean. The leaves emit when rubbed a strong aromatic smell which excites sneezing, and on this account it is used medicinally. *T. polium*, Mountain Poly, is a native of Europe and Africa, on the shores of the Mediterranean.

TEUTHIDÆ, Professor Owen's name for the *Calamaries*, his fourth family of Decapodous Cephalopods, derived from *Teuthos* (*τεῦθος*), ap-

plied by Aristotle to the *Ten-Armed Malakia* with an internal horny plate or gladius.

Animal, sometimes oblong and depressed, generally elongated and cylindrical; with a pair of fins varying in their relative size and position, but generally broad, shorter than the body, and terminal.

Shell, internal, rudimental, in the form of a thin, straight, elongated, horny lamina; encysted in the substance of the dorsal aspect of the mantle. [SEPIADÆ.]

TEUTONIC NATIONS is the general name under which are comprised the different nations of the Teutonic race, which are divided into three branches. The first branch contains the High Germans, to whom belong the Teutonic inhabitants of Upper and Middle Germany, those of Switzerland, and the greater part of the Germans of Hungary: it is subdivided into the Suabian and the Franconian minor branches. The second is the Saxon branch, which is divided into three minor branches: the first branch contains the Frisians, the second contains the Old Saxons or Low Germans, with the Dutch, the Flemings, and the Saxons of Transylvania; and the third contains the English, the Scotch, and the greater part of the inhabitants of the United States of North America. The third branch is the Scandinavian, to which belong the Icelanders, the Norwegians, the Danes, and the Swedes.

Light hair and blue eyes in the northern countries, and brown hair and brown or blue eyes in some of the southern countries, are characteristics of the Teutonic race. Their stature is generally tall, although in those provinces where the Germans are mixed with Wends, Sorabians, and Bohemians, many of the people have the broad shoulders and the short square form of the north-western Slavonians. The straight black hair of some Slavonian tribes also sometimes appears. The mixture of Germans with the south-western Slavonians, such as the Croatians, whose stature exceeds that of the Wends and Bohemians, is more difficult to be distinguished, the black straight hair and a darker complexion being almost the only indication of such a mixture. The mixture of Germans with Celts in Belgium and in the adjoining part of France has formed a tall race which differs from their Teutonic neighbours only in the dark colour of their hair and their black eyes.

The name of Teútones appears to have been first made known to the Greeks and Romans by Pytheas of Marseille [PYTHEAS], in B.C. 320, who discovered a nation of this name in the present countries of Holstein, Schleswig, and Denmark. The Teutones afterwards became known to the Romans as formidable enemies, and at the end of the second century before the Christian æra and the commencement of the first, they invaded the south of France and the north of Italy. [MARIUS.] The Romans, when they first heard of the Teutones, thought that they were a single tribe: they did not know that it was the general name of all those nations to which they afterwards gave the vague designation of Germans.

The element *Teut* occurs in the names of a great number of ancient Teutonic chiefs, as Teutoboech, Theodoric, and many others. It occurs also in names of places, as Teutoburger Wald, and in other localities in Germany. It is said that in some of the German dialects *Teut* still signifies God, father, ruler, and so forth. The element appears or seems to appear in a great number of German words. The word *Teuton* is identical with *Deutsche* or *Teutsche* (in Low German *Dütsch*,, in Dutch *Duitsch*, in Danish *Tysk*, in English *Dutch*), which from the remotest time has been and is still the general name of that part of the Teutonic nations which we now call Germans, who considered the god or hero Tuisco as their common ancestor. There are no direct proofs of the word Teuton having had this extensive meaning in the earliest German history, but this is perhaps the result of the political state of the Teutonic nations, which were originally divided into numerous tribes, each of which became separately known to the Romans. In the 12th, 11th, and even as early as the 10th century, when the difference between Franks and Saxons was well marked in the German Empire, these nations, each of which had its own language and laws, never objected to being called by the general name of Deutsche or Teutones. At present there is no German tribe which has the particular name of Teutones, but, although the Germans are composed of two very distinct nations, the High Germans and the Low Germans, they call themselves Deutsche and their language Deutsche, though they do not understand each other.

The Teutonic race is originally from Asia, and they immigrated at different times; some of them as late as the fourth and fifth centuries. When the Teutonic nations appeared in history, they were divided into many bodies or confederations of tribes, such as, at a later period, the Franks, the Suevi, the Saxons, the Marcomanni, and the Alemanni. Long before these names were known, there was a similar confederation of tribes which came from the N.N.E., and which conquered the countries on the left bank of the Rhine, then inhabited by Celtic nations, which fled to their brethren in Central Gaul. The epoch of this invasion is not known, but the event happened a long time before the age of Cæsar, who found those countries settled by a Teutonic population. Tribes of the Condrusi, the Eburones, and others, were united in a confederation, and had adopted the name of Germani, or 'war-like men.' This name was gradually used by the Romans to designate other nations which belonged to the Teutonic race (Tacitus, 'Germ.,' c. 2), and subsequently it was adopted by the English as a name for the 'Deutsche,' while this name, changed into Dutch, now designates the inhabitants of Holland. A sketch of the general history of the Teutonic nations is given in the article 'Teutonic Nations,' in the 'Penny Cyclopædia.'

TEVIOTDALE. [ROXBURGHSHIRE.]

TEWKESBURY. [GLOUCESTERSHIRE.]

TEXAS, one of the United States of North America, is bounded S. and S.W. by Mexico, W. by New Mexico, and E. by the Gulf of Mexico, Louisiana, and Arkansas, and N. by the Indian Territory. By an Act of the Congress of the United States, passed in Sept., 1850, it is decreed that the boundary of the State of Texas

on the N. shall commence at 36° 30′ N. lat., 100° W. long., thence run due W. to 103° W. long., thence due S. to 32° N. lat., thence due W. to the Rio Grande del Norte, thence along the Rio Grande del Norte to the Gulf of Mexico. This will take away nearly one-third of the previously recognised limits of the State. For the territory which it is thus proposed that Texas shall cede to the United States, and for other claims upon the general government, a sum of 10,000,000 dollars is to be paid by the United States, in stock bearing 5 per cent. interest, and redeemable in 14 years. *A Territory of New Mexico* has been formed out of the land previously included in the district of New Mexico together with the land taken away from Texas. The area of Texas, within the limits originally defined, was 397,819 square miles. The Act of Congress has not yet been assented to by the State of Texas; if it be, the area will then be reduced to about 260,000 square miles. The State Census in 1847 gave a population of 143,205, of whom 39,060 were slaves.

Surface and Soil.—The sea-coast of Texas is low, and the whole of the sea-coast region, varying in breadth from 50 to 100 miles, consists of a fertile alluvium, with very few swamps, and those not large. Numerous rivers and streams water this region, which consists as yet for the most part of extensive meadows, but is extolled for its capability of producing cotton of the finest quality. The country south of the Red River, which forms the northern boundary of Texas as far W. as 100° W. long., is an extensive plain considerably elevated above the beds of the rivers, which however in this part of Texas are comparatively few. Except in the river-valleys the ground is generally arid, and the vegetation which the spring produces is dried up by the summer heat. From the sea-coast region and the eastern elevated plain the ground rises towards the W., and becomes undulating, with a breadth E. to W. of 100 to 200 miles. This region is described as consisting of a rich soil covering substrata of limestone and sandstone, and presenting a great variety of woodlands and fine pastures. Still farther to the W. and N. the country rises to the Guadalupe Mountains and the Sierra del Sacramento. These mountains are supposed not to rise higher than 2000 or 3000 feet above their bases, which however are on a high table-land. Among these mountains most of the large rivers that water Texas have their origin.

Rivers.—The largest river is the Rio del Norte, which in the lower part of its course is called the Rio Grande del Norte. It forms the boundary between Mexico and Texas as far as the sources of the river Gila, which river is now the boundary of Mexico on the N. [MEXICO, viii., 530, 531]. The rivers which flow through the State are very numerous, have generally a regular course, and most of them are navigable for small craft in the greatest part of their course. The most remarkable of these rivers from W. to E. are—the Rio Nueces, which flows about 250 miles with a general S.E. course; the Rio Guadalupe, which is nearly as long, and which falls into a lagune forming the harbour of Espiritu Santo; the Colorado, or Red River of Texas, which traverses in its upper course the mountain-tract of San Saba, flows upwards of 400 miles, and falls into the lagune constituting the harbour of Matagorda; the Rio Brazos, or Brazos de Dios, whose origin is near to that of the Red River, and which, flowing chiefly S.S.E., intersects nearly the centre of Texas and the most fertile districts. It enters the sea after a course of more than 400 miles, forming at its mouth a harbour, with a bar on which only from three and a half to five and a half feet of water are found. The Rio Trinidada, after a course of more than 300 miles S.S.E., falls into Galveston Bay. The Red River, which forms the boundary of Texas on the N., is an affluent of the Mississippi. [MISSISSIPPI, River.] The Sabine, which separates Texas from Louisiana, is noticed under LOUISIANA.

Climate and Productions.—The climate of Texas is mild and generally wholesome, and the inhabitants are not subject to the Yellow Fever even in the low country of the coast. Bituminous coal is said to be abundant in the interior, and iron-ore is also plentifully distributed. Building stone is abundant in all parts except the sea-coast region. Gold, silver, copper, and lead, have been found in the mountainous parts of the State. Oak, pine, and other large timber trees, are abundant along the courses of the rivers and upon the slopes of the mountains. Texas is stated to have climates and soils suitable for maize, wheat, oats, barley, and rice; for apples, pears, figs, melons, and oranges; for the vine, olives, and mulberries; for the sugar-cane and the cotton-plant; and in fact for almost every kind of grain, fruit, and vegetable. Cattle, horses, and mules, are exported in considerable numbers to the other states of North America.

Divisions and Towns.—Texas is divided into 36 counties. The seat of government is *Austin*, 30° 25′ N. lat., 97° 45′ W. long., on the N.E. bank of the Rio Colorado. It is yet only a small place. *S. Antonio de Bexar*, a Spanish town, situated on the W. bank of an affluent of the Rio S. Antonio, had formerly a population of 10,000, but is supposed to contain now less than 5000. *Galveston*, situated at the northern end of Galveston Island, at the entrance into Galveston Bay, which admits vessels drawing 12½ feet water, has a population of about 6000. *Houston*, on the S. bank of the Buffalo River, which falls into Galveston Bay, has a population of about 5000.

Constitution.—The Constitution of the State of Texas was adopted in convention at Austin, Aug. 27, 1845, and was ratified by the people, Oct. 13, 1845. The legislature consists of 21 senators, who are elected for 4 years, and 66 representatives, who are elected for 2 years. The governor is elected for 2 years. Texas sends 2 senators and 2 representatives to Congress.

History.—Texas was formerly a part of the Spanish viceroyalty of Mexico. When the confederation called the United Mexican States was formed, Texas was annexed to the State of Coahuela. It was established as a separate State in Aug., 1824, and the State Constitution was promulgated in March, 1827. In March, 1836, a declaration of independence was issued, and a

constitution proclaimed on the model of the southern States of North America. Its independence was subsequently recognised by the Congress of the United States, and afterwards by France and Great Britain; but as the government of Mexico still persisted in its refusal to acknowledge the independence of the country, proposals were made to annex the republic to the United States, and an act of Congress of the United States, March 1, 1845, declared Texas to be one of the United States of North America.

TEXEIRA, or TEXERA, JOSEPH, was born in Portugal about 1543. After distinguishing himself at the university, he entered the order of St. Dominic in 1565. He was prior of the convent of Santarem in 1578, when King Sebastian undertook his expedition into Africa. In the troubles which ensued Texeira attached himself to the party of Don Antonio, and accompanied that prince to France in 1581. Texeira published at Paris, in 1582, a compendium of the history of Portugal, which is now very scarce, but it appears to have been published for the purpose of supporting Don Antonio's claim to the throne of Portugal. The author was taken prisoner by the Spaniards in the naval battle off Terceira, July 26, 1582, and carried to Lisbon, whence he contrived to make his escape and rejoin Don Antonio.

The partisans of the League having obliged Don Antonio to quit Paris, Texeira accompanied him as his confessor, first to Bretagne, and in 1586 to England. In 1588, having returned to France, he was introduced to Henri III. and the queen-mother. From that time he continued in France, and was employed both by Henri III. and Henri IV. In August, 1595, Don Antonio died, after which he entered into the service of the house of Condé. In 1601 he published a narrative of the adventures of Don Sebastian, 'from his expedition into Africa in 1578 till the 6th of January of this present year 1601.' Most of his other works are more or less political, and relate to the events of the time, but none are of any material value. Texeira died in the convent of the Jacobins at Paris, June, 1604.

TEXEIRA, or TEXERA, PEDRO, a native of Portugal, is stated, not on the clearest authority, to have been born in 1570. Little is known of him, except that he passed several years in Persia, and wrote a work entitled, 'Relacion de los Reyes de Persia y Ormuz: Viagi de la India Oriental hasta Italia por Tierra el año de 1604,' Antwerp, 1610. Down to the time of Tavernier and Chardin, Texeira appears to have been regarded as the principal authority respecting Persia.

TEXEL. [HOLLAND, *North.*]

TEYDE. [CANARIES.]

TEZEL, or TETZEL, JOHANN, a Dominican monk, who lived about the end of the 15th and the beginning of the 16th century. He was a native of Leipzig, and entered the order of the Dominicans in the Pauliner Kloster. In 1502 the pope appointed him preacher of indulgences for Germany. He converted this office into a most lucrative traffic, and his conduct was altogether so bad, that he was condemned at Innspruck to be sewed up in a sack and to be drowned, having been convicted of adultery. But the sentence was first changed into imprisonment for life, and shortly afterwards he was set at liberty at the request of Albert, archbishop of Mainz, and other ecclesiastical dignitaries. Tezel now made a pilgrimage to Rome, where Pope Leo X. appointed him commissarius apostolicus in Germany, in addition to which the archbishop of Mainz made him 'inquisitor hæreticæ pravitatis.' As papal commissary he carried on his traffic in indulgencies more boldly than ever. At last, in 1517, Luther openly opposed him in the celebrated theses which he fixed on the church-door of Wittenberg. Tezel after this incurred the censure of his superiors, but, nevertheless, in 1518, he obtained the degree of Doctor of Divinity at Frankfurt-on-the-Oder. After this event he returned to Leipzig to his convent, where he died, in August, 1519.

THA'LAMUS, a botanical term which was applied by Linnæus to the calyx or outer whorl of floral envelopes. It is also used in Cryptogamic botany to express the bed of fibres from which many fungi spring up.

THALA'SSEMA, Cuvier's name for a genus of footless Echinoderms placed by him immediately after *Bonellia*. This genus is subdivided into the subgenera *Thalassema*, *Echiurus*, and *Sternapsis*.

THALASSINIANS. The genus *Thalassina* of Latreille consists of those macrurous decapods which have the four anterior feet terminated by two fingers; the foliations of the lateral fins of the end of the tail narrow and elongated, without ridges; and the last segment of the tail, or the intermediate piece, in the form of an elongated triangle. Sometimes the four anterior feet, or the first two feet and one of the second, are terminated by two elongated fingers, forming a claw perfectly. The two anterior feet are the longest; the lateral foliations of the fin terminating the tail are in the form of a reversed triangle, or widest at the posterior border; the intermediate piece, on the contrary, narrows from the base to the termination, and ends in a point.

M. Milne Edwards arranges the family of *Thalassinians*, or *Burrowing Macrura*, between the *Scyllarians* and the *Astacians*. He divides them into two tribes, *Cryptobranchids* and *Gastrobranchids*. To the former belong the genera *Glaucothöe*, *Callianassa*, *Axia*, *Gebia*, and *Thalassina*; to the latter *Callianidea* and a genus too imperfectly known to be conveniently characterised.

THALASSIOPHYTES (literally 'sea-plants') is the name given by Lamouroux to designate the vegetable productions of the ocean and of its rocks and shores.

THALES, a native of Milétus, but descended of a Phœnician family, is said to have been born B.C. 640, and to have lived to near a hundred years of age. Thales is enumerated among the Seven Wise Men, whose wisdom was not the theoretical wisdom of philosophers, but the wisdom of actual life. Accordingly we find that Thales took an active part in the political affairs of his native country. Before Ionia fell under the Persian yoke, he advised the Ionians to have one common council, and to establish it at Teos, the

centre of Ionia; and he further suggested that all the other Ionian states should be reduced to the condition of parts dependent on the government at Teos. Such a scheme, if carried into effect, might have checked the progress of the Persian arms. (Herod., i. 170.) Later writers say that he visited Egypt and Crete in order to improve his knowledge, and that he derived from Egypt his acquaintance with mathematics. There seems no reason for thinking that Thales left any writings. Thales is generally considered the founder of the Ionian school, though he can hardly be viewed as the founder of a school. He is the first who predicted eclipses; and he is said to have laid down the sun's orbit, and to have fixed the length of the year at 365 days. His philosophical speculations on the nature of the universe were vague, as such speculations always have been. He sought for a first principle of all things, and found it in water or moisture (Aristot., 'Metaphys.,' i. 3); but we must not infer from this that his system was atheistic, for his first principle may have been purely a physical theory. The traditions recorded of him by Diógenes Laertius make him a believer in a Deity. 'The most ancient of things existing is God, for he is uncreated; the most beautiful thing is the universe, for it is God's creation.' It was one of the maxims of Thales, that death did not differ from life: 'Why don't you die then?' said an objector, more witty than wise. 'Because there is no difference,' was the reply.

THALICTRUM, the name of a genus of plants belonging to the natural order *Ranunculaceæ*. *Th. aquilegifolium*, the Feather Columbine, is a native of Europe, in woody districts of Germany, France, and Italy. The stems and stamens of this plant vary in colour, sometimes being greenish-white and sometimes purple. A variety is found in Austria with dark purple stems and stamens, and is called *Th. a. atropurpureum*. *Th. minus*, Lesser Meadow-Rue, is a native throughout Europe. In Britain it is found in chalky pastures, and on the sea-coast where shell-sand abounds. The Greater Meadow-Rue, *Thalictrum majus*, is also a native of Great Britain, though rare. *Th. flavum*, Yellow Meadow-Rue, is a native of all districts in Europe. In Britain it occupies wet meadows, the banks of rivers, and ditches. It has a root of a yellow colour, and is said to resemble, both in appearance and properties, rhubarb. *Th. fœtidum*, Fetid Meadow-Rue, is a native of France, Switzerland, Russia, &c., and is found in valleys and on hill sides, and in the fissures of calcareous rocks. It smells more powerfully than any of the species—hence its specific name.

THALLUS is a botanical term used exclusively in cryptogamic botany, and is generally applied to the part of the plant which bears the reproductive organs, and constitutes the principal part of its vegetation.

THAME. [OXFORDSHIRE.]

THAMES, the most important river in Great Britain, rises in the central part of England, and flows eastward into the German Ocean.

The spring which has commonly been regarded as the head of the Thames is about three miles S.W. from Cirencester, near a bridge over the Thames and Severn Canal which is called Thames-Head Bridge; but that which is to be regarded as the true head of the Thames is about 3 or 4 miles S. from Cheltenham. Two streams rise, one from 14 springs at what is popularly called The Seven Wells, and the other from 4 springs near Ullen Farm, the most western of which springs is the real or remotest head of the river. Both streams rise on the S.E. slope of the Cotswolds, and form by their junction, about a mile from their respective sources, the river Churn, which flows on the E. side of Cirencester, and thence S.E. to Cricklade. At Cricklade, 19 or 20 miles S.E. from its source, the Churn joins the Isis or commonly reputed Thames, the length of which above the junction is only about 10 or 11 miles.

From Cricklade the river flows 9 or 10 miles E.N.E. to Lechlade, receiving on the way the Ray (11 miles long) and the Cole (14 miles long), both on the south bank. Just above Lechlade it receives on the north bank the Colne (23 miles long) from the Cotswold Hills east of Cheltenham; and just below Lechlade it receives the Lech, or Leach (19 miles long), which also rises in the Cotswolds. From Lechlade the Thames flows 14 miles E. to the junction of the Windrush (34 miles long), which rises in the Cotswolds, and joins the Thames on the north bank. Below the junction of the Windrush the Thames makes a bend to the N. and N.E., receiving on the north bank the Evenlode (31 miles long), which rises in the Cotswolds, and receives the Glyme, which flows through Woodstock and Blenheim Park. The Thames then turns S., and flows to Oxford, where it receives the Cherwell (44 miles long), which rises in the Arbury Hills near Daventry, and joins the Thames on the north bank.

From the junction of the Cherwell the Thames flows 16 miles S.S.E. to the junction of the Thame at Dorchester, making however a considerable bend W. to Abingdon, where it receives the Ock (18 miles long), which rises at the foot of the chalk hills of Berkshire, between Compton Beauchamp and Ashbury, and joins the Thames on the S.W. bank: the Thame rises near Stewkley in Buckinghamshire, and flows 39 miles S.W. by the town of Thame into the Thames, which it joins on the N.E. bank. From Dorchester the course of the Thames is S.E. 22 miles in a winding channel by Wallingford to the junction of the Kennet near Reading (53 miles long), which rises near Broad Hinton, a village N. of Marlborough Downs, and joins the Thames on the south bank.

From the junction of the Kennet the Thames flows E., though in a very winding channel, making first a considerable circuit to the N., by Henley, Great Marlow, and Maidenhead to Windsor; and then a considerable circuit to the S. by Staines, Chertsey, Kingston, and Richmond to Brentford, whence it proceeds by Hammersmith, Putney, and Chelsea to the metropolis. In this part of its course the Thames receives several feeders. The Loddon, 24 miles long, rises in the chalk downs of North Hants, near Basingstoke; the Coln, 38 miles long, rises, under the name of the Ver, in the chalk downs of

Hertfordshire, and passes St. Albans, Watford, Rickmansworth, Uxbridge, and Colnbrook; the Wey, 36 miles long, rises near Alton, Hampshire, passes Farnham, Godalming, and Guildford, and joins the Thames at Weybridge; the Mole, 41 miles long, rises on St. Leonard's Forest, in Sussex, passes through Leatherhead, and joins the Thames at East Moulsey; the Cran and the Brent, two small streams, each about 18 miles long, rise on the borders of Middlesex and Herts, and join the Thames, the first at Isleworth, the second at Brentford; and the Wandle, a stream only 9 miles long, joins it at Wandsworth. Of these the Coln, the Cran, and the Brent fall into the Thames on the left or north bank; the others on the right bank.

Below London, up to which sea-borne vessels ascend, the river flows E., but with various bends, or 'reaches,' 48 miles to the Nore, which is generally considered as the place where the river terminates. Between Deptford and Greenwich, about 4 miles below London-Bridge, the Thames receives on the south bank the Ravensbourne, 10 miles long, from Keston, near Bromley in Kent; about 3 miles farther down, on the north bank, the Lea, 50 miles long, which rises in Bedfordshire, and passes Luton, Hertford, Ware, and Waltham Abbey: 4 or 5 miles lower, the Roding, 38 miles long, from near Dunmow, also on the north bank; and 6 miles lower, on the south bank, the Darent, 20 miles long, which passes Dartford and receives the Cray. The only remaining feeder of the Thames which here requires notice is the Medway, above 60 miles long, which rises in Sussex, and flows by Tunbridge, Maidstone, Rochester, and Chatham. The principal arm of the Medway joins the Thames at Sheerness just above the Nore; but the smaller arm, called the Swale, which cuts off the Isle of Sheppy from the mainland of Kent, opens into the æstuary of the Thames just above Whitstable.

The whole course of the Thames, from its source to its mouth, is about 212 miles.

	Miles.
Length of the Churn . . .	20
From the junction of the Churn and Isis at Cricklade to Lechlade .	9
To the junction of the Windrush .	14
To the junction of the Cherwell .	13
To the junction of the Thame . .	16
To the junction of the Kennet. .	22
To London Bridge	70
To the mouth.	48
	212

The Thames, in the first part of its course, belongs wholly to Gloucestershire, but below Cricklade is almost entirely a border river, dividing Gloucestershire from Wiltshire, Oxfordshire, and Buckinghamshire from Berkshire, Middlesex from Surrey, and Essex from Kent.

The navigation of the Thames commences at Lechlade, where the river is about 258 feet above low-water mark at London Bridge. The Thames and Severn Canal, which follows the valley of the Churn and the Thames from near Cirencester, opens into the Thames at Lechlade, thus connecting it with the Severn and the western coast of the island. At Oxford the Oxford Canal joins the Thames, and opens a communication with the great canal system of the central counties. At Abingdon the Wilts and Berks Canal joins the Thames, and, as well as the Kennet and Avon Canal, which joins the Kennet at Newbury (where the navigation of that river commences, 20 miles above its junction with the Thames), opens a communication with the Somersetshire Avon, and by it with the Severn. The Thame is navigable from the town of Thame, about 17 miles above its junction with the Thames. The Wey is navigable from Godalming, about 17 miles from its junction; and is connected with the Wey and Arun Canal, and the Basingstoke Canal, the former of which opens a communication with the river Arun and the Sussex coast. The Grand Junction Canal, which unites with the Oxford Canal at Braunston in Northamptonshire, opens into the Thames by the mouth of the Brent, the lower part of which is incorporated with the canal. Below London Bridge the Lea, which is navigable, chiefly by artificial cuts, for 25 miles, opens into the Thames; and just above the Lea, the Regent's Canal, which encircles the north and east side of the metropolis, and communicates with the Paddington Canal, and so with the Grand Junction Canal, also opens into the river.

The Medway is navigable below Rochester Bridge for sea-borne vessels, and from Penshurst, above 43 miles from its mouth, for river craft.

The navigation of the Thames, in its upper part, is kept up by locks and wears, the lowest of which is at Teddington, which is consequently the limit of the tide. Teddington is about 18 or 19 miles above London Bridge. High-water mark at Teddington is about one foot and a half higher than at London Bridge, and the time of high water is about two hours later. Low-water surface at Teddington is about 16½ feet higher than at London Bridge.

At ebb-tide there is a depth of from 12 to 13 feet water nearly or quite up to London Bridge, and the rise of the tide is about 17 feet, or at the extreme springs about 22 feet.

Vessels of 800 tons get up to the St. Catherine's Docks, and those of 1400 tons to Blackwall, about 6 miles below bridge. No river in the world equals the Thames in its commercial importance. The river for some 2 miles or more below London Bridge is crowded with vessels, chiefly coasters, steam-vessels, and colliers, which moor alongside the quays or in tiers in the stream; others are moored lower down, though not in such numbers; and for larger vessels there are several docks excavated on the bank of the river. There is a dockyard for the navy (now little used) at Deptford, about 4 miles below London Bridge; one at Woolwich, 9 miles below; one at Sheerness, in the Isle of Sheppy, at the junction of the Thames and Medway; and one at Chatham, the most important of the four, on the Medway. The fortifications at Sheerness defend the entrance to both rivers; the passage of the Thames is further protected by Tilbury Fort, and that of the Medway by Gillingham Fort.

The width of the river at London Bridge is nearly 700 feet. For nearly the whole way below London Bridge the river is embanked, and is almost throughout its lower course skirted with marsh-lands, which however have nowhere a great extent. The width of the river at Woolwich is about a quarter of a mile; at Gravesend, 26 miles below London Bridge, and opposite Tilbury Fort, it is more than half a mile; about 4 miles below Gravesend it is nearly a mile; and then gradually widens to about 6 miles at the Nore.

THANE, in Anglo-Saxon *Thegn*, from *thegnian*, or *thenian*, 'to serve,' the same word with the modern German *dienen*, is frequently, in conformity with its origin, translated *minister* in the Latin charters of the Anglo-Saxon period. In other cases its equivalent is *miles*, or *fidelis miles*. In this general sense it may be considered as nearly the same with the Norman term liege or liegeman. The exact meaning of the term as a title of honour is involved in considerable obscurity. After the Conquest thanes (*thaini* or *taini*) are frequently classed with barons (barones): in the laws of Henry I. the two words are apparently used as synonymous; and where the Saxon Chronicler has thanes (*thegenas*), the Latin annalists have commonly *barones*. These were the superior or king's thanes. The class of common or inferior thanes seems to have answered nearly to that of the barones minores, or landed gentry. One of the few things that are tolerably certain with regard to the rank of a thane is, that it implied the possession of a certain amount of landed property. Many lands are mentioned in Domesday-Book as thane-lands (*terræ tainorum*); and it is probable that the dignity, like the oldest of the Norman baronies, was sometimes attached to a particular estate. Thanes were among the members of the Saxon Witenagemot, or parliament, but it is matter of dispute whether they sat in their own right or as elected representatives. The principal facts connected with this dignity in England have been collected by Mr. Sharon Turner, in his 'History of the Anglo-Saxons,' 8vo., London, 1823, vol. iii.; by Sir Francis Palgrave, in his 'Rise and Progress of the English Commonwealth,' 4to., 1832; and Kemble's 'Saxons in England,' 1849.

THANET, ISLE OF. [KENT.]

THANN. [RHIN, HAUT.]

THA'PSACUS, or THA'PSACUM, was a very ancient town in Syria, on the right bank of the Euphrates, about 24 miles W. of the junction of the river Chaboras (the Araxes of Xenophon) with the Euphrates. Thapsacus, the Thiphsach of the Bible (1 Kings, iv. 24), the Taphsa of the Vulgate, and the Thapsa of Josephus ('Antiq.,' ix. 11), was the most eastern town of the kingdom of Solomon after David had conquered the country as far as the Euphrates.

THA'PSIA, the name of a genus of plants belonging to the natural order *Umbelliferæ*. The species are mostly natives of the countries of the Mediterranean, and are known under the generic name Deadly Carrot. *T. villosa*, Velvety Deadly Carrot, is found in Portugal, Spain, the south of France, in Italy, and the northern coasts of Africa. Poiret states that when fresh the root is acrid and corrosive. *T. silphium*, Silphium Deadly Carrot, is a native of the north of Africa, on the mountains of Cyrenaica, and is supposed to be the plant that produced the juice called *Silphium*, and which was held in such high repute by the ancients, that a district where it grew in abundance was called Silphifera. *T. Garganica*, Garganian or Greek Deadly Carrot, is a native of Calabria, Mauritania, Greece, Sicily, Sardinia, Spain, &c.

THASOS, now *Thaso*, or *Tasso*, an island situated off the coast of Thrace, at a short distance from the mouth of the river Nestus or Karasou, and a little to the S.E. of the Gulf of Kavallo. Volgaro, which is nearly in the centre of the island, is in 41° 45′ N. lat. and 24° 40′ E. long.

Thasos was first peopled by Phœnicians, who came from Tyre in quest of Europa, the daughter of Agénor, according to the old story, led by Thasos, son of Agenor, from whom the island is said to have taken its name. (Herod., ii. 44.) It was afterwards colonised by settlers from Paros (Thucyd., iv. 104), among whom was Archilochus the poet, in 708 or 720 B.C. Thasos was enriched in very early times by the possession of gold mines in the island, and at Scapte Hyle, on the opposite coast of Thrace. According to Herodotus, who visited them, the most considerable were those which had been worked by the Phœnicians. The island was subject to the Athenians after the Persian war, B.C. 480. After many changes of fortune Thasos finally became a free city (libera civitas) under the Roman emperors.

Thasos is about 40 Italian miles in circumference. (Carpacchi, 'Isole del Mondo.') Its greatest length is from north to south. In the northern and highest part of the island three peaks extend in a north-west and south-east direction. The inhabitants, amounting to 5000 or 6000, are all Greeks, and live in nine villages. The chief produce of this fertile country is oil, maize, honey, and timber; the last grows in great abundance and in picturesque variety everywhere, particularly on the southern and western sides, and forms the chief article of export. The plane-trees in particular are of great size. Little wine is made here, and some is imported from Ténedos; the principal food of the inhabitants is maize. Large herds of cattle and flocks of sheep are kept in the island: asses and mules are more used than horses on account of the steepness of the roads. The inhabitants are hospitable, industrious, and simple in their manners.

THAW is the reduction of ice or snow to a liquid state in consequence of an increase of temperature. The dissolution of the particles of ice in the atmosphere is the cause of the humidity which accompanies a thaw.

A severe and long-continued frost abstracts so much caloric from terrestrial bodies, as the walls of buildings which are not exposed to the sun, that these are often cooled below the temperature of freezing water; and while in this state, if a current of warm air pass over their surfaces, the water which the air holds in solution deposits itself on the walls, where it is converted into ice or snow: it remains thus frozen for a time after a

thaw has commenced, but at length, the temperature increasing, the ice is melted and the walls are then covered with moisture.

It is often remarked that at the time of a thaw taking place there is felt a degree of coldness greater than that which is experienced during the continuance of the frost; this is apparently caused merely by the evaporation of the moisture which is then on the skin, for the thermometer at the same time indicates an elevation of temperature in the atmosphere.

THEA, a genus of plants of the tribe *Camellieæ* and natural family of *Ternstromiaceæ*, which has been so named from the slightly altered Chinese name of the dried herb which now forms the almost universal beverage of the British Isles. Though now so extensively employed, the introduction of tea into Europe is of comparatively recent origin. Macpherson, in his 'History of European Commerce with India,' states that 'tea (sah) is mentioned as the usual beverage of the Chinese by Soliman, an Arabian merchant, who wrote an account of his travels in the East about the year A.D. 850;' and that he had been unable to find any mention of it prior to the times of the Jesuit missionaries, who entered China and Japan a little before the middle of the 16th century. Anderson, in his 'History of Commerce,' vol. ii., p. 178, quotes Botero as giving the earliest account in 1590, when he says that 'they,' that is, the Chinese, 'have also an herb, out of which they press a delicate juice, which serves them as drink instead of wine.' Anderson says that no mention is as yet made (1660), in the new book of rates, of tea, coffee, or chocolate, though they are all mentioned in an act of parliament of the same year, whereby a duty of eight-pence is charged on every gallon of chocolate, sherbet, and tea, made for sale. But the use of it at that time must have been new; for Pepys, in his 'Diary,' writes, Sept., 25, 1661, 'I sent for a cup of tea (a Chinese drink), of which I had never drank before.' The Dutch East India Company probably first introduced it into Europe, and from Amsterdam it was brought to London.

The species of the genus *Thea* are few in number. Some botanists are of opinion that even these are varieties of a single species called *Thea Chinensis*. Botanical writers describe commonly two species, *T. viridis*, supposed to yield green tea, and *T. Bohea*, yielding black tea.

The Asam tea-plant, which has lately attracted so much attention, seems to partake of the characters of both of the foregoing, and is regarded by some botanists as a distinct species.

Tea is cultivated in China over a great extent of territory. Dr. Wallich mentions it as being cultivated in Cochin-China, in 17° N. lat. We know it is cultivated in the southern provinces of Yunnan and of Canton. If we proceed north we find the principal cultivation of teas for the foreign trade is between 27° and 31° N. lat.; but tea is said to be produced in several places to the northward of 31°; even in 36°, and also in the Japanese Islands, which extend from 30° to 41° N. lat. The culture of the tea-plant in China seems simple enough. The plants are raised from seeds, sown in the places where they are to remain. Several are dropped into holes four or five inches deep and three or four feet apart, shortly after they ripen; or in November and December, as they do not preserve well, from their oiliness. The plants rise up in a cluster when the rain comes on, and require little further care, except that of removing weeds, till they are three years old, when they yield their first crop of leaves. They are seldom transplanted, but sometimes four to six plants are put close together, so as to form a fine bush. After growing seven or ten years they are cut down, in order that the numerous young shoots which then spring out may afford a more abundant supply of leaves. In some districts the bushes grow unrestrained, in others they are regularly pruned, to keep them low. The gathering of the leaves is performed with great care: they are usually gathered singly, first in March or May (according to the district), when the young leaves are scarcely expanded; the second about two months later, or May and June; and the third in August, or about six weeks after the second; but the times necessarily differ in different districts, as well as the number of crops which are obtained, some avoiding the third, for fear of injuring the bushes. When the leaves are gathered they are dried in houses which contain small furnaces, on each of which there is a flat iron pan, and upon this, when heated, the leaves, partially dried by exposure to the sun, are thrown; the leaves require frequent shifting and turning. When all are properly dried, they are quickly removed either by the hand or with a shovel, and either thrown upon a mat or into baskets which are kept ready to receive them. They are then removed to a table where they are rolled and cooled, and the process is repeated; after which they are sifted and sorted into several varieties.

The most difficult part of this question is to determine whether the green and black teas are produced by one or two distinct species of plants, as the statements of apparently equally well-qualified judges are not only contradictory, but directly the reverse of each other. The Chinese tea-makers in Asam and those in Java alike state that the black and green teas may be prepared from the same plant.

Tea having become so extensive an article of commerce, and a source of considerable revenue, various attempts have been made to introduce it into other countries, but the climates are very different in which the several experiments have been made, as in Rio Janeiro and the warm part of Brazil, and latterly in the hilly parts of Java and Brazil, in Penang, Asam, and the Himalayas. Favourable reports are given of the teas grown in the East Indies, but as yet only small quantities are brought into European markets.

With regard to the dietetical effects of tea, it is difficult to form a correct estimate. The most dispassionate inquirers regard it as a narcotic, the stimulating period of which is the most conspicuous and of longest duration. It is less suited for young children than for adults; indeed for very young children it is extremely improper, pro-

ducing, like all narcotics, a morbid state of the brain and nervous system. It is also unsuited for those of an irritable nature, and likewise for those of a leucophlegmatic constitution. Such persons can ill bear much liquid of any kind, particularly in the evening, and prosper best on a very dry diet to which growing children of this constitution should be strictly confined. The peculiar influence of tea seems to depend on the presence of a principle called theine, which is also present in coffee. This acts on the nervous system, and probably supplies some element necessary to the maintenance of the integrity of the brain and nerves. Liebig gives the following account of its action :—

'Without entering minutely into the medical action of caffeine (theine), it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield taurine, the nitrogenised compound peculiar to bile :—

1 atom caffeine or theine	= C^8	N^2	H^5	O^2
9 atoms water . .	=		H^9	O^9
9 atoms oxygen . .	=			O^9
	C^8	N^2	H^{14}	O^{20}
= 2 atoms taurine .	= 2 (C^4	NH^9		O^{10})

'To see how the action of caffeine, asparagine, theobromine, &c., may be explained, we must call to mind that the chief constituent of the bile contains only 3.8 per cent. of nitrogen, of which only the half, or 1.9 per cent., belongs to the taurine. Bile contains, in its natural state, water and solid matter, in the proportion of 90 parts by weight of the former to 10 of the latter. If we suppose these 10 parts by weight of solid matter to be choleic acid, with 3.87 per cent. of nitrogen, then 100 parts of fresh bile will contain 0.171 parts of nitrogen in the shape of taurine. Now this quantity is contained in 0.6 parts of caffeine; or $2\frac{8}{10}$ths grains of caffeine can give to an ounce of bile the nitrogen it contains in the form of taurine. If an infusion of tea contain no more than the $\frac{1}{10}$th of a grain of caffeine, still, if it contribute in point of fact to the formation of bile, the action, even of such a quantity, cannot be looked upon as a nullity. Neither can it be denied, that in the case of an excess of non-azotised food and a deficiency of motion, which is required to cause the change of matter of the tissues, and thus to yield the nitrogenised product which enters into the composition of the bile; that in such a condition the health may be benefited by the use of compounds which are capable of supplying the place of the nitrogenised substance produced in the healthy state of the body, and essential to the production of an important element of respiration. In a chemical sense—and it is this alone which the preceding remarks are intended to show—caffeine, or theine, asparagine, and theobromine, are, in virtue of their composition, better adapted to this purpose than all other nitrogenised vegetable principles. The action of these substances, in ordinary circumstances, is not obvious, but it unquestionably exists. Tea and coffee were originally met with among nations whose diet is chiefly vegetable.' (Liebig's 'Animal Chemistry,' p. 178.) These facts show in what way tea may prove to the poor a substitute for animal food, and why females and literary persons who take little exercise manifest such partiality for it. They also explain why the attempts, and they have been numerous, to find among other plants a substitute for tea have invariably failed of success. The first tea-leaves were procured from the Chinese in exchange for those of the *Salvia officinalis*, or garden sage, but they, like others, soon found out its inferiority, and refused to part with their own precious leaf except in exchange for solid coin. The poor Chinese make use of the leaves of a fern, and also of those of the *Sagaretia* (*Rhamnus*) *theezans*; but to this their poverty, not their will, consents.

Tea Trade.—The first importation by the English East India Company took place in 1669 from the Company's factory at Bantam. The directors ordered their servants to 'send home by their ships one hundred pounds weight of the best *Tey* they could get.' In 1678 4713 lbs. were imported, but in the six following years the entire imports amounted to no more than 410 lbs. According to Milburn ('Oriental Commerce'), the consumption in 1711 was 141,995 lbs.; 120,695 lbs. in 1715; and 237,904 lbs. in 1720. In 1745 the amount was 730,729 lbs. In 1844 it was 41,363,770 lbs. The tea consumed in the United Kingdom, and the revenue which it yielded, in 1847, 1848, and 1849, were as follows :—

1847 .	46,314,821 lbs. .	5,066,494*l.*
1848 .	48,347,789 lbs. .	5,329,992*l.*
1849 .	50,021,576 lbs. .	5,471,422*l.*

There have been great changes in the taxes levied on tea. In 1834 the excise-duty on tea was repealed; and in 1836 the duty of 2*s.* 1*d.* per lb. was laid on all sorts of tea.

For above a century and a half the sole object of the East India Company's trade with China was to provide tea for the consumption of the United Kingdom. The Company had an exclusive trade, and were bound to send orders for tea, and to provide ships to import the same, and always to have a year's consumption in their warehouses. The teas were disposed of in London, where only they could be imported, at quarterly sales. The 3 & 4 Wm. IV., c. 93, on April 22, 1834, opened the trade to China. The importation of tea is now no longer confined to the port of London, and the trade has increased both in the quantity and variety of the exports to China.

The tea-duty produces about one-twelfth of the total revenue. In 1801 it was 1,423,660*l.*, in 1844, 4,524,193*l.* The amount in 1847, 1848, and 1849 is stated above. The tariff of 1842 made no alteration in the tea-duty. As it was foreseen that on the opening of the tea trade there would be a considerable reduction in price, and that an *ad valorem* duty would not, even with the increased consumption, be so productive as formerly, a fixed duty of 2*s.* 1*d.* per lb. was imposed in 1836, as already observed. Up to March, 1836, each of the hundred thousand tea-dealers in the United Kingdom was visited once a month by the officers of excise, who took an account of his stock; and

no quantity exceeding 6 lbs. could be sent from his premises without a permit, of which above 800,000 were required in a year. Tea is now sold by the importing merchants by public auction and private sales.

The duty on tea is still too high, and it is certain that an increased consumption would follow a diminution of the duty.

The total export of tea from Canton to Europe and America exceeds 50,000,000 lbs. Russia is supplied with 6,500,000 lbs. through Kiakhta; the United States of America require about 8,000,000 lbs.; France about 2,000,000 lbs.; and Holland imports about 2,800,000 lbs. Some tea is now imported into England from Asam, where its culture has been introduced by the British.

THE'ATRE (from the Latin *theâtrum*, which is from the Greek Θέατρον, 'a place for seeing'), a word adopted in modern languages to signify a building appropriated to dramatic representations. The oldest edifices of this class are those of the Greeks and Romans. The great extent of many of them, and the prodigious solidity of their construction, are attested by the numerous remains of such edifices, which have been explored not only in Greece and Italy, but also in Asia Minor.

But the very magnificence and sumptuousness of some of the ancient theatres also prove how destitute of anything approaching to scenic illusion and stage effect the performances must have been. Whether it be at all exaggerated or not, it is evident from what Pliny ('Nat. Hist.,' xxxvi., c. 15) says of the theatre of Scaurus at Rome, that the *scena* was a mere architectural façade, unmeaning in itself, though lavishly embellished with marble columns and statues, with no fewer than 360 of the former, arranged in three tiers, and 3000 of the latter, a most incredible number; for it is difficult to conceive how they could all have possibly been introduced. Pliny puzzles us still more when he says that the middle of the scena (meaning the second of the three orders) was of glass. The scena too was always a permanent architectural erection, incapable of change, and instead of having reference to the particular performance, it must frequently have been at variance with it. It has been supposed that, besides the permanent scena, the ancients employed, occasionally at least, moveable painted scenes, capable of being let down before it. Yet while this can be only vaguely inferred, the presumption against it is founded both on its impracticability and its extreme improbability. Considering the immense size of the stage, what there was of painted scenery at all must have been confined entirely to two 'versuræ' at the sides or ends of the stage, which served as 'wings,' and which were upright triangular frames made to revolve upon a central pivot, so that any of the three sides could be turned towards the audience.

From the use of the term *Aulæa* it has been generally concluded that the whole stage was concealed by a curtain both previous to the commencement of the performance and whenever it was requisite to make any change in the decorations. But we agree with Winkelmann, that such could not have been the case, because it could hardly have been practicable, and was quite unnecessary as regarded the permanent scena or architectural façade.

In favour of the ancient stage however, there were no 'foot-lights,' and consequently the faces of the performers were not lighted from beneath. Yet even this advantage was nullified by the use of masks.

On considering the audience part, and the accommodation provided for the spectators, although there the arrangement of an ancient theatre was in some respects preferable to that of modern ones, it was not free from many inconveniences. The most obvious one is, that as there was no roof, there was no shelter from the weather. Beautiful too as the arrangement of all the seats in concentric rows is in itself, it is attended with some disadvantage, for instead of being placed, as in the pit of a modern theatre, parallel to and immediately facing the stage, a considerable portion of the audience must have sat sideways to it, and those at the ends of the further or upper benches could hardly have had any view of the scena at all, at least not in the Greek theatre.

The Greek and Roman theatres very nearly resemble each other; the general arrangement and the essential parts being the same in both—the *Coelum* (Κοῖλον), *Orchestra* (Ὀρχήστρα), and *Scena* (Σκηνή) in the one, and the *Cavea*, *Orchestra*, and *Scena* in the other. The cavea was the general term for the whole of the space appropriated to the seats of the spectators, which were all concentric with the orchestra, and which were intersected, in one direction, by ascents or flights of steps dividing the seats into compartments.

Between the Grecian and Roman orchestra there was a very wide difference as regards the purpose to which that space was appropriated. In the Roman theatre it was a continuation of the rest of the auditory, being occupied with seats and spectators, with no other difference than that the spectators were senators and other persons of dignity, and that benches or chairs must have been ranged parallel to the stage. The Greek orchestra, on the contrary, was, as its name imports, made use of for the dancers, musicians, and singers, whose performances constituted so important a part of the entertainment.

Another point of difference between the Grecian and Roman theatre is, that in the former the stage was considerably elevated above the orchestra, 12 feet or upwards, consequently there was a wall of that height at the back of the orchestra, to which was given the name of Hyposcenium, or Lower Scena, and which formed a sort of architectural basement to the stage, and was adorned with niches and statues.

The form of the orchestra determined that of the exterior of the building. While the Roman theatres therefore did not exceed a semicircle, those of Greece had a greater curve. In the Greek theatres however the orchestra was not always extended beyond a semicircle, by the curve being continued, but sometimes by straight lines at right angles to the chord. Grecian theatres were almost in-

variably built on the sloping side of a hill, so that, as regards the coelum, it was merely necessary to shape it out, and erect the seats; consequently there was no other architectural exterior than that formed by the Parascene and colonnade behind the stage. The Roman theatres, on the contrary, were erected on level ground, and therefore the curved part of the exterior was confined to a semicircle, a form which unites better with the rectangular one and its straight lines.

The theatre at Athens (called that of Bacchus) was by no means so spacious as many others, its diameter being only 250 feet, and that of the orchestra 72 feet, which are very moderate dimensions in comparison with those of some of the Asiatic theatres. The diameter of the theatre at Miletus was 474 feet, and that of the orchestra 224 feet. The diameter of the theatre of Marcellus at Rome was 517 feet, and that of the orchestra 172 feet.

Fortunately the ancient theatre was not taken as a model for modern structures of the kind. The revival of theatrical representations took place before anything was known relative to that branch of architectural archæology, and under very different circumstances. In the meanwhile a taste for scenic display had developed itself, which required a very different arrangement of the stage and its apparatus from that of the ancients. Imperfect as they were, the dramatic pageants and recitations performed before Leo X. were exhibited with great magnificence, and some of the greatest artists were employed upon the decorations. Even in the preceding century dramatic exhibitions had been produced at Florence in a style of great magnificence. Public theatres on the present system were not built till the early part of the 17th century, just before which time an attempt had been made to restore the form of the ancient theatre and stage, with the permanent architectural scena and its entrances, by Palladio, whose celebrated Teatro Olimpico at Vicenza was completed by Scamozzi after Palladio's death.

There certainly was good reason at one time for exclaiming against modern theatrical architecture as very defective in regard to the audience portion of the interior; and although great reforms have since taken place, yet there is still room for further improvements. There should be no seats at a greater height than midway that of the curtain, or the level of what is now the second tier of boxes in our large theatres; for, as the scenery can be painted only to one horizon, generally that of the stage itself, its perspective effect is more or less impaired when it is seen from either very much above or below that level. No less preposterous is the practice of continuing the side-boxes up to the proscenium, and sometimes (as in the Opera-house at London) quite up to the very curtain. Not only ought there to be a distinct proscenium, serving as an architectural frame to the stage and its scenery, dividing that part of the theatre from the rest, but it ought to be of much ampler proportions than are now given it. It may be said that these improvements would diminish the capacity of theatres to contain a large number of persons; but it should be also remembered that a great deal of space is at present devoted to saloons and stately approaches which might be otherwise employed. This is especially the case in many continental theatres.

In regard to the form of the interior, a decided improvement has taken place of late years; and the circular plan, or one approaching to it (either extended by the curtain being a tangent to the circle or somewhat beyond it, or reduced by the curtain intersecting and forming a chord to the segment), may now be considered the one established as being the most pleasing and commodious. But there is considerable difference of opinion as to its being the best form in regard to hearing. In fact, the science of acoustics is not yet brought to exactness as regards practical purposes in building. Here the chief guide is experience; and experience seems at present to be at any rate not at all against the circular form; for the new theatres at Mainz, Dresden, and other places where it has been adopted, are said to be perfectly satisfactory in regard to the actors being distinctly heard in every part.

While in their internal embellishment and fitting up theatres afford great scope to the architect, they also afford opportunity for accomplishing much in regard to characteristic external design. After all it is the stage itself, with its multifarious contrivances and complex mechanism, its scenery and pictorial effects, which manifest the extraordinary perfection to which the moderns have carried the scenic art. It does not enter into our purpose however to speak of stage mechanism which is a subject and study by itself. Those who seek for information of the kind will meet with it in Stephenson's work on the machinery of theatres. Neither need we make any addition here to what has been already said on the subject of SCENE-PAINTING.

THEATRE (Law). Before the reign of Elizabeth theatrical representations appear to have been subject to no legal restraint beyond the liability of those who conducted them to the vagrant laws. But it is probable that the practice of granting licences from the crown prevailed as early as the reign of Henry VIII. The earliest theatrical licence from the crown now extant is that granted by Queen Elizabeth, in 1574, to James Burbage and four other persons, 'servants to the Earl of Leicester.' These licences from the crown were originally nothing more than authorities to itinerate, which exempted strolling players from being molested by proceedings taken under the laws of proclamations against vagrants, and also superseded the necessity of licences from local magistrates.

Although theatrical representations became much more general in the reigns of James I. and Charles I., no laws were enacted for their regulation, with the exception of the stat. 1 Car. I. c. 1, which suppressed the performance of 'interludes and common plays' upon the Lord's Day. An ordinance of the Long Parliament, in 1648, was directed to the suppression of all stage-plays and interludes, but though occasionally enforced with much rigour, it failed to abolish these entertainments. The 12 Ann., stat. 2, c. 23, in

general terms, classed players of interludes as rogues and vagabonds; but the stat. 10 Geo. II., c. 28, s. 1, expounded the former statute, by enacting that 'every person, who should for hire, gain or reward, act, represent or perform any play or other entertainment of the stage, or any part therein, if he shall not have any legal settlement where the offence should be committed, without authority by patent from the king, or licence from the lord chamberlain, should be deemed a rogue and vagabond within the stat. 12 Ann.' This provision is now repealed by the stat. 5 Geo. IV., c. 83, and players as such, whether stationary or itinerant, are, at the present day, not amenable to the law as rogues and vagabonds. The above statute, 10 Geo. II., c. 28, with the exceptions just mentioned, is still in full operation, and forms the law of the metropolitan theatres. This act of parliament contains a clause which restricted the power of granting patents by the crown to theatres within the city of Westminster and places of royal residence. But a few years after special acts of parliament were passed, which exempted several large towns, in which such entertainments were desired, from the operation of that clause, and authorised the king to grant letters for establishing theatres in such places. Instances of statutes of this kind occur with respect to Bath, in stat. 8 Geo. III., c. 10; with respect to Liverpool, in the stat. 11 Geo. III., c. 16; and with respect to Bristol, in the stat. 18 Geo. III., c. 8.

A further relaxation of the rule established by the stat. 10 Geo. II., c. 28, for the regulation of theatrical performances, was effected by the statute 28 Geo. III., c. 30, in favour of places which could not bear the expense of a special act of parliament. By this latter statute, the justices of the peace at general or quarter sessions are authorised to license the performance of any such tragedies, comedies, interludes, operas, plays, or farces, as are represented at the patent or licensed theatres in Westminster, or as have been submitted to the Lord Chamberlain, at any place within their jurisdiction not within 20 miles of London, Westminster, or Edinburgh, or 8 miles of any patent or licensed theatre, or 10 miles of the king's residence, or 14 miles of either of the universities of Oxford or Cambridge, or 2 miles of the outward limits of any place having peculiar jurisdiction.

The penalties imposed by the stat. 10 Geo II., c. 28, being found insufficient to prevent the performance of theatrical entertainments without licence, the legislature, in the year 1839, gave additional powers to the metropolitan police for their prevention, by the 46th section of the stat. 2 & 3 Vict., c. 47.

The 3 & 4 Wm. IV., c. 15, and subsequent acts, regulate property in dramatic compositions.

THEATRICAL REPRESENTATIONS. [DRAMATIC ART AND LITERATURE.]

THEBAID, or THE'BAIS, signifies the territory or district belonging to Thebes, and it was applied to the whole territory subject to the city of Thebes in Bœotia. In a similar, though a much wider sense, the name was given to the whole of Upper Egypt, the modern Said, of which Thebes was the principal city. This territory extended from Hermópolis Magna southward as far as the first cataracts of the Nile, or to Philæ; or, according to others, as far as Hiera Sicamina. This great province was, according to Strabo, originally divided into ten nomes (νομοί); but Pliny ('Hist. Nat.,' v. 9) enumerates eleven, and others mention fourteen.

THEBES (Θῆβαι, Thebæ). Towns and cities of this name occur in several parts of the ancient world, but the two which are most renowned in history are the Egyptian and the Bœotian Thebes.

Thebes in Egypt, in the Bible called No or No Ammon, was situated in the central part of Upper Egypt, which derived from this city the name of Thebais. [THEBAID.] This city consisted of two main parts, which were divided by the Nile, one occupying the eastern, and the other the western bank of the river, and each extending from the river to the foot of the hills which enclose the valley of the Nile. This gigantic city, whose ruins still excite astonishment, was believed to be the most ancient town of Egypt. Its original circumference is stated to have been 140 stadia. Its most flourishing period appears to have been about 1600 B.C., when it was the capital of all Egypt. During that period, which probably comprises several centuries, Thebes was the residence of the Egyptian kings, whose tombs are still extant in the rocks on the western side of the city, and extend even to the borders of the desert. During the invasion of Egypt by the Persians under Cambyses, B.C. 525, Thebes, like other towns, suffered very severely, especially the private dwellings, which were for the most part constructed of wood, while the great architectural works defied the flames as much as they have defied the slower influence of time. After this catastrophe the city appears never to have recovered her former greatness. During the time of the Ptolemies, when the seat of government was in the northern extremity of the country, Thebes appears to have been neglected by the Egyptian kings. In the reign of Ptolemæus Lathyrus, about B.C. 86, it revolted, and after a siege of three years it was taken and plundered by the Greeks. As early as the time of Strabo, when its name Thebes had been changed by the Greeks into Diόspolis, that is, the city of Jove, and the circuit of the city, which could still be traced, amounted to 80 stadia, the place consisted of a number of villages, and what remained of the ancient city consisted chiefly of temples. Under the Roman dominion something appears to have been done to restore or preserve the venerable city; but new calamities broke in upon it when Christianity was introduced into Upper Egypt, and the Christians in their religious zeal destroyed and appropriated to themselves as much as they could of the works of the ancient idolators. At present the site of the city is occupied by four principal villages, Luxor and Carnac on the eastern, and Gournou and Medinet-Abou on the western side of the river. The buildings and sculptures still extant are the most ancient of any that exist in Egypt, and are the best and most genuine specimens of Egyptian art and architecture, for the greatest part of them were executed before Egypt had yet experienced the influence of the Greeks,

that is, long before the Persian invasion. (B.C. 525.) The ruins, chiefly consisting of temples, colossi, sphinxes, and obelisks, occupy nearly the whole extent of the valley of the Nile, a space of 6 miles from east to west; and on the western side, where the ruins of the city end, there begins, as it were, the city of the dead, the tombs in the rocks, with their paintings, which are still as fresh as if they had been made only a few days ago. ('Egyptian Antiquities,' 2 vols., in 'Library of Entertaining Knowledge;' Wilkinson's 'Topography of Thebes,' in his work 'On the Manners and Customs of the Ancient Egyptians,' chap. v.)

Ruins of the Temples.—At Luxor, near the river, are the remains of a temple, the entrance to which is through a magnificent própylon, or gateway, consisting of two pyramidal moles, the lower part of which is now concealed by accumulated sand, but which probably form a propylon as large as that of Carnac hereafter described. In front of the propylon, which is covered with elaborate sculptures, stood two of the most perfect obelisks known to exist, one about 82 feet high, the other 76, and from 8 to 10 feet wide at the base. The smaller obelisk was removed by the French and set up in the Place de Concorde, at Paris, in 1836.

The remains of Carnac, about a mile and a quarter lower down the river, are still more wonderful than those of Luxor. An irregular avenue of sphinxes, 2180 yards in length, connects the southern entrance of Carnac with the northern entrance of the temple of Luxor. Carnac is about 830 yards from the east bank of the Nile, and is surrounded by a wall of unburnt bricks about 5300 yards in circuit, or more than three miles. The largest of the remains, which some have thought to be a temple and some a palace (it may have been both), is 1215 feet in length, 360 feet in its greatest width, and 321 feet in its least width. The entrance to it (the western entrance) fronts the Nile, with which it is connected by an alley of crio-sphinxes (sphinxes formed of the body of a lion and the head of a ram). This alley conducts to a propylon, without sculpture, 360 feet long and 148 feet high, with a great doorway in the centre 64 feet high; passing through which a large court is entered, having a range of pillars on the north and south sides, and a double row of loftier pillars down the middle, which terminate opposite two colossal statues in front of a second propylon. A flight of twenty-seven steps then leads to an enormous hall, which has been called the Great Hypostyle Hall of Carnac. It is 338 feet by 170½ feet, and comprises an area of 57,629 square feet.

Four propyla, with colossi in front of them, form the entrance on the south side, at the end of the long avenue of sphinxes leading from Luxor.

Thebes in Bœotia, one of the most ancient cities of Greece, was situated in the plain between lake Hylice on the north and a range of low hills on the south. The Acrópolis of the city, built upon an eminence in this plain, was said to have been founded by Phœnicians under Cadmus, whence it was called Cadmea. Around this citadel the city arose at a later time. Previous to the Trojan war the city was destroyed by the Epigoni, that is, the descendants of the seven Argive heroes who had been defeated by the Thebans; and from this destruction it does not appear to have recovered before that war, as it took no part in the expedition against Troy. In the time of Homer however, who calls it 'a city with seven gates,' and gives it the attribute of *εὐρύχορος*, on account of the extensive plain which formed its territory, it appears to have again been in a flourishing condition. In 335 B.C. Thebes was destroyed a second time by Alexander the Great. Cassander rebuilt the city in B.C. 316, with the aid of the Athenians, Messenians, and Megalopolitans. The city suffered a third time in B.C. 291, under Demetrius Poliorcétes. Sulla seems to have given it the last blow by depriving it of half its territory, which he assigned to the Delphians; and Strabo remarks that in his time it had scarcely the appearance of a village (ix., p. 403, ed. Casaub.). In the time of Pausanias the citadel, then called Thebes, was still inhabited, but the lower city was entirely abandoned; and he only saw the walls, gates, and temples, of which he gives a description. The place which now occupies the ancient Cadmea is called Theba, or Pheba, and in Turkish Stiva; and here, as well as in the surrounding plain, there are many remains of ancient buildings, sculptures, and inscriptions. The inhabitants of ancient Thebes were distinguished above all the other Greeks for rusticity, fierceness, and passion.

In early times Thebes was governed by kings, but it afterwards became an oligarchy. This form of government, although it was frequently restored for a short time, gave way to a democracy.

Along with the assembly, which, at least in later times, was as tumultuous as that of Athens (Polybius, vi. 44), Thebes also had a senate; and the magistrates, who were elected annually by ballot, bore the name of polemarchs. As a state Thebes was not confined to the city and its immediate neighbourhood, but comprised the whole territory between the eastern coast of lake Cópais and Mount Cithaeron, and extended to the north as far as the little river Cephissus, which empties itself in the sea between Eubœa and the mainland. This whole territory was called Thebais, and contained a great number of towns which were subject to Thebes. Among the fourteen confederate states of Bœotia, Thebes was the first, whence it is generally called the capital of Bœotia, which, in the strict sense of the word, it was not. [BŒOTIA.]

END OF VOL. XI.

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